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FODDER CONSERVATION

Grain Storage on the Farm

By J. A. MORROW, B.Agr.Sc., Senior District Agricultural Officer

After a run of seven good seasons in succession, the catastrophic losses of farm live stock in Victoria, particularly of sheep, during the 1944–45 drought, have been almost forgotten. The magnitude of these losses may be gauged from a perusal of the figures for Victoria in the year prior to the drought and the year following. The sheep population declined from 19,220,457 head in 1944 to 14,655,277 in 1946, a wastage of more than four-and-a-half million valuable sheep in 24 months.

In the same period, dairy cow numbers dropped by 55,838 head ; beef and other cattle by 130,108, and pigs by 65,991. When the year 1946 turned out to be favorable and paddocks were knee high in grass, there were not enough Victorian cattle and sheep left to eat it and this led to the purchase interstate of highly-priced "stores" to replace animals which in many instances could have been saved if ample reserves of fodder had been put aside in years of plenty.

These figures and others from earlier years have long since convinced the thinking farmer that droughts and lean seasons are recurrent features of our climate and he accordingly prepares his defences against them as a prudent man will do against fire and other natural disasters. Some, however, have not learned the lesson of the seasons and it is these farmers who lose heavily when a drought does come.

Over the years the Department of Agriculture has stressed the need for the conservation of adequate supplies of fodder on the farm, and to-day is pursuing its campaign with even greater intensity. Of recent years, because of our urgent need for more exportable produce, fodder conservation has taken on an even greater significance.

There are three principal methods of conserving fodder—silage making, grass and cereal haymaking, and grain storage. The two first-named are the most widely practised in Victoria, but in parts of the State grain also is a valuable adjunct to these fodders, having the added virtues of compactness and of supplying stock food in a highly-concentrated form.

In the following article, the author outlines storage methods for grain, its protection and the uses to which it may be put.

IF efforts to increase farm production are to be successful, greater attention must be given to the maintenance and care of live stock. Landholders are already convinced of the desirability of running live stock in conjunction with other forms of farming, but many are not reaping the full advantage because of their failure to conserve sufficient fodder or to protect it adequately. For some farmers a prolonged drought would be calamitous.

The quantity and quality of animal production will benefit greatly if adequate supplies of fodder are on hand at all times.

In the better rainfall districts, conservation of meadow hay is gradually becoming an integral part of farming operations and, although much improvement in the quantity, quality, and methods of storage is still possible, there are indications that more farmers are endeavouring to even out seasonal growth by conserving fodder for the lean periods and poor seasons which, in a climate such as ours, are inevitable.

In general, the cereal districts do not lend themselves to large-scale conservation of meadow hay. They also are more subject to seasonal variations and drought. In

A common sight during the 1944–45 drought. Adequate stores of grain may have saved these sheep.

these districts sheep raising in recent years has assumed greater importance and, as sheep numbers increase, the risk of loss through fodder shortage becomes more acute.

Pastures are often supplemented by cereals grown for grazing but, although this provides valuable forage, some other form of supplementary reserve is necessary to produce best results with sheep and to ensure that they can withstand drought conditions.

Labour shortages and the harvest rush restrict the quantity of cereal hay which can be conserved. Birds and mice may cause severe losses. On the other hand grain can be harvested cheaply and stored conveniently, and all farmers in the wheat-growing areas would benefit if they regularly set aside portion of their stubble land for growing oats specifically for fodder reserves. Oats are readily saleable and any excess over farm requirements can be sold when the safety of the stock is assured. For reasonable security storage of one bag per sheep is not excessive.

Increasing quantities of grain are held on farms for supplementary stock feeding, but there is room for a great deal of improvement in grain storage methods. Losses are considerable.

Damage by mould, rats, mice, and weevils is common and, in isolated cases, heating has occurred. Fouling and loss of grain sometimes occur through poultry or stock having access to reserves. Losses also when feeding out are often larger than sometimes believed. Most of these losses are avoidable.

GRAIN MUST BE DRY WHEN PLACED IN STORE

The storage of grain when damp or immature may result in the development of mould or heat and favour insect attack.

In Victoria, we are fortunate that we do not normally require specially designed equipment for artificially drying grain for storage. Under Victorian conditions, weather conditions at harvest time usually ensure that the grain is dry enough for immediate storage. There are occasions, however, when the sample contains quantities of immature grain, resulting from irregular ripening of the crop or from second growth. Where the presence of such grain is easily detected, the grain may be considered unfit for immediate storage in bulk. Where immature grain is present, the bags should be loosely filled. They should not be " dumped " and, before storage, are best placed in rows exposed to the sun and wind. Bagged grain, wetted by rain, requires similar exposure to hasten drying. Where white ants are present, the bags should be moved every few days to prevent attack. If it is necessary to remove the grain from the paddock, it should not be placed in storage immediately, but either treated as above or spread out and turned frequently until thoroughly dry.

STORAGE METHODS

Methods of storage vary considerably. Grain may be stored loose in silos, tanks or bins of various construction, or in bags.

Whatever the method used it is essential that the grain should be so stored that convenience in handling is facilitated, and also that the grain is adequately protected from moisture and vermin.

1. Convenience of handling.
2. Protection from moisture.
3. Protection from vermin.

1. Convenience of Handling

USE SOUND BAGS.

Grain is frequently lost from holes in bags or when filled bags are torn on nails or other projections. Second-hand bags should be examined and, if necessary, repaired before harvest.

If the grain is carted in unsewn bags, the bags should not be filled so full that grain will be spilt during handling. Grain is often lost from badly-sewn bags or at the harvester or storage container. Cracks or knotholes in the containers allow grain to escape and also permit the entry of vermin.

Grain is often fouled by poultry and damage by larger stock is not unknown, particularly if the grain is stored in bags.

GRAIN STORAGES.

When obliged to use existing grain storages it is often possible to make alterations which will result in greater ease of handling and in safer storage. Each farm will have its own particular conditions and, if there is any difficulty in filling or removing the grain without waste or protecting it from vermin or live stock, the possibility of improving the arrangements should be investigated. Frequently, minor structural alterations will add greatly to the safety and convenience of the storage. Spilt grain is not only a direct loss, but is also an invitation to rats and mice to remain in the locality and a breeding ground for weevils and other pests.

The walls of old barns may require bracing or reinforcement to withstand the pressure of stored grain. Alternatively, a false wall may be erected, using bagged grain for the purpose.

When new storages are being constructed there are several factors to be considered. The type of storage will depend on the farmer's preference, whether it is to be self-contained or part of another structure.

Silos or tanks are very satisfactory for the storage of grain. They can be readily fitted for easy filling and emptying, and the grain is not liable to damage by mice or fouling by poultry or stock. Preventive measures against weevils can be easily applied and, if fumigation becomes necessary, it can be done quickly and effectively.

When selecting the site for a silo, consideration should be given convenience in carting grain to and from the storage. The site should be accessible in all weathers and, if the grain is to be used exclusively

Live stock are valuable and every precaution for ensuring their safety should be taken.

Ample reserves of grain will save the lives of stock when pastures fail.

for stock feeding, much time will be saved by having the silo reasonably close to where the stock are to be fed. It should be placed in a position where periodical inspections can be readily made. Structural features also need consideration.

Silos or tanks are best mounted on a platform high enough for bags to be filled from a chute at the base. The chute should be of convenient size for bag filling and fitted with a sliding door to facilitate control of the flow of grain and to permit instant closing when desired. The chute should be arranged so that it directs the grain to the centre of the mouth of the bag held by a bag holder which may be of the " dumping " type if desired.

It is an advantage to have two outlets for the grain—one at each side of the silo—so that it can be more completely emptied before it is necessary to get inside and shovel the grain to the door. Sliding doors taken from the box of an old harvester are suitable.

When mounting a silo or tank on a platform it is necessary to have a good flat surface. If sawn timber is not available, round timber may be used but it should be levelled by adzing and covered with a layer of clay. It is important to have sufficient support in the centre because the greatest weight falls there and any sagging may break the soldered floor joints of the receptacle. The tank should be securely anchored or it may be displaced by heavy winds when it is empty.

It will not be so necessary to mount the tank or silo on a platform if a grain auger is available for emptying. In this case an auger chute could replace one of the trap-doors and the silo may then be conveniently erected on a concrete base dispensing with the iron floor. The concrete should be treated to make it waterproof and no moisture should be allowed to seep in where the silo is attached to the base.

The roof should be raised at the centre to run off any rain and the manhole through which the grain is passed should be so constructed that no water can be admitted when the lid is fitted. A wooden framework is erected on which to rest the bags when they are being filled or to support an elevator, auger or blower. A ladder is also desirable.

A tank 14 ft. 9 in. in diameter and 12 feet high will hold 1,600 bushels or 530 bags of grain and a tank 12 ft. 3 in. in diameter and 12 feet high will hold 1,100 bushels or 368 bags.

Prefabricated silos can be purchased and local plumbers will be able to build corrugated iron silos to given specifications.

Storage in Barns.

If the storage is to be made in a barn or section of a barn, the portion to be used for the grain should be strongly supported to carry the weight, and the boards or iron fitted as neatly as possible to prevent the

entry of vermin and to facilitate fumigation. The piers or stumps on which it is built should be capped with tin, and the methods of mouse-proofing dealt with later in this article adopted.

Where the barn is also to be used for other purposes it may not be possible to have it built on a mouse-proof raised platform. This may cause some inconvenience when feeding out and provide some inaccessible refuge for rats and mice under the floor. In these circumstances a water-proofed concrete floor would be an advantage or it may be possible to construct a raised floor for the storage bin. The latter would result in some loss of storage space but would make emptying and bagging easier. If the barn is built on a platform, maximum use of the storage space can be obtained and bagging facilitated by having a trap-door fitted with bag hooks opening to the outside.

The storage section should be boarded off, making a definite storage bin, and provision should be made for entry and inspection. While mice do not normally cause much damage to loose grain, it would be a wise precaution to mouse-proof overhead timbers with tin. There may be occasions when the store may be required for bagged grain or other produce.

A storage space of approximately 12 ft. x 24 ft. x 10 ft. would be required to store 2,000 bushels. The capacity of a container in bushels may be obtained by dividing the content in cubic feet by 1·28.

The floors of containers could be sloped to give maximum emptying by gravity, but on account of loss of space and extra construction costs this is seldom undertaken.

Feeding Out.

Feeding out of grain has become a common practice in sheep-raising districts, but the operation is frequently performed in a very haphazard manner. Apart from grain actually lost by spilling, there are losses resulting from faulty methods of distribution and failure to regulate the quantity fed.

When undertaking feeding, whether it is to supplement grazing or to provide drought rations, the quantity of grain fed should be considered in the light of the fodder available and the requirements of each individual flock. It should be measured accordingly.

If troughs or self-feeders are used, they should be so arranged that all sheep will have an equal opportunity of obtaining their ration. Under drought and semi-drought conditions, the use of self-feeders is often impracticable and, where troughs are used, the sheep in greatest need are frequently deprived of their share. The use of larger numbers of troughs more widely scattered would help in the more uniform distribution of the grain, but a more effective and economical method has been suggested by the Commonwealth Scientific and Industrial Research Organization, after conducting a series of drought-feeding trials with sheep. Twice-weekly or weekly feeding was found to be more satisfactory than daily feeding in that the weaker sheep were able to obtain their share and the labour involved was materially reduced.

The wheat grower who is also a stock-raiser would be well advised to grow some oats on the farm for feeding to his animals in times of scarcity.

Successful stock raising demands assured fodder supplies.

The practice of allowing the grain to trickle down from the back of a truck as it moves across a paddock only partially solves the problem of preventing the stronger sheep from getting more than their share, and sometimes results in appreciable loss through grain falling in inaccessible places. The plan adopted by some farmers of depositing small concentrations of grain in scattered places will result in more even feeding and, in some cases, reduce wastage considerably.

Distribution of the grain, so that none is wasted in the paddock and with all sheep obtaining their share of a calculated ration, can result in considerable saving. This is important where grain supplies are limited and when it cannot be estimated for how long supplementary feeding may be necessary.

If adequate quantities of grain are grown for supplementary stock feeding on each wheat farm and if proper precautions are taken in harvesting, storage, protection, and distribution, live stock production can be increased and the risk of severe drought losses reduced considerably.

2. Protection from Moisture

Grain should be protected from moisture. Water leaking through the roof or walls may form pockets of damp grain favorable for the development of mould.

Differences in temperature may cause the moisture to be transferred to cooler parts of the bulk and make it sufficiently damp to start a fresh development of mould.

One leak in the roof may cause mould to develop in several different parts of the storage. A roof which is good enough for a machinery shed or barn may let in sufficient water to cause extensive damage to stored grain. Drips of water formed from condensation on the underside of the roof may cause damp patches, particularly in frosty weather. Hessian stretched across the grain will catch the drops of water and give them a chance to evaporate before they reach the grain.

If the roof projects beyond the edge of the storage and has sufficient slope, the water tends to run down and fall outside, lessening the risk of damp spots occurring in the grain.

The floor should be impermeable to water. Wooden floors should be built clear of the ground. In some cases trouble due to dampness has occurred in storages with concrete floors. Unless specially treated, concrete is not always damp proof and, unless the floor rests on well-drained permanently dry ground, it should be covered with some waterproofing material. When erecting a new storage with a concrete floor, trouble from dampness may be avoided if a water barrier is put in between the foundations and the floor. The barriers could consist of a coating of bitumen or prepared waterproofing material.

3. Protection from Vermin

Vermin attacking stored grain are mainly rats, mice, and weevils. Undoubtedly the best protection can be obtained when the grain is stored in silos, tanks or in iron or concrete bins. If these are sound, rats and mice are unable to enter and the danger of weevil infestation is greatly reduced.

(*a*) Rats and Mice.

Eradication of rats and mice frequently presents many difficulties, particularly in barns, and little permanent control can be expected until the barn is made mouse-proof.

Where the barn has corrugated iron sides and a solid floor, mouse-proofing is relatively easy, provided the iron is in good order and fits snugly. If there is any gap between the two sheets of iron at the overlap, mice may be able to climb up. As a precaution against this, and particularly where second-hand iron is used, it may be necessary to cap the iron at the top of the wall with pieces of tin protruding a few inches over the joins. Where the iron fits up against wooden uprights, the fitting should be flush and the uprights capped.

If the barn has a wooden floor, the boards should fit closely and apertures, such as knot holes or joints, are best covered with tin. Doors also should fit well and, in floors raised above the ground, all timber supporting the barn should be capped. Mice frequently gain entrance to a corrugated-iron barn through the corrugations at floor level. By dinting these and filling them with concrete this can be prevented.

If the above precautions are taken, the barn can be fumigated and further entry of rats or mice will be prevented unless brought in with other material or until someone forgets to close the door.

Fumigation for Rats or Mice.

Fumigation with cyanide preparations, such as cyanogas or calcyan can be satisfactory, but on account of the danger to human beings and live stock, it should be undertaken with extreme caution. No barn should be fumigated unless it can be effectively sealed and locked to prevent the unwitting entry of any person. "Poison" notices should be conspicuously displayed and the barn thoroughly ventilated before anyone enters after its fumigation.

Control of rats and mice in old wooden buildings presents a much more difficult problem. Fumigation is generally ineffective, and in some cases extremely dangerous. Under these conditions the only hope of success is the waging of war with baits and traps. There are several prepared rat poisons on the market and these can be effective if used in accordance with the makers' instructions. Used in conjunction with traps and other methods, the following baits have proved effective :—

(i) Arsenic 1 oz., grated cheese ½ oz., fine oatmeal to make a total of 1 lb.

(ii) Carbonate of barium 3½ oz., grated cheese ½ oz., fine oatmeal to make a total of 1 lb.

The ingredients should be thoroughly mixed and the baits put in concealed places rather than in the open. Care should be taken to prevent children or poultry from gaining access to the baits.

Traps should be used in conjunction with baits. It is important that precautions should be taken to avoid any trace of human scent remaining on the trap or bait. The use of gloves will help in this regard.

Any cover provided by rubbish, old bags and the like should be removed and as many steps as possible taken to make the sheds rat-proof.

A mouse-proof grain silo is an asset on any farm where stock are produced.

The rats should be continuously disturbed and, as far as possible, all edible materials kept in rat-proof containers. The use of cats or dogs in the vicinity of the sheds will discourage rats.

For mice, baits containing strychnine and crushed or whole wheat are satisfactory, but must be laid in conjunction with other measures if reasonably good control is to be obtained.

(*b*) Weevils.

Weevils are responsible for considerable damage in stored grain.

Clean grain stored in clean containers will remain free from weevils unless access from outside is gained. It is not always possible to be certain that either the grain or the container is free from weevils.

They may be introduced from the harvesting machinery, bags, and vehicles or may be present in crevices in the container. Residues of grain left in the storage space may also harbor weevils. Spilt grain, old bags, litter and machinery in the shed are frequently sources of infestation.

The first steps in weevil control should take place before harvest actually begins. The barn or container should be thoroughly cleaned out and the floor and walls sprayed with weevil oil or dusted with 5 per cent. benzene hexachloride at the rate of 1 oz. per 3 square yards of surface, care being taken to ensure that all cracks and crevices are thoroughly treated. Any machinery or other material stored in the barn should also receive attention.

Bags are a common source of infestation and should not be left lying around. They should be treated for weevils and stored. A convenient method of treatment is to dust the bags with benzene hexachloride or to fumigate them in a suitable container, using carbon bisulphide, chloropicrin or other fumigant. The container should be capable of being sealed effectively during fumigation. An old 44-gallon drum is suitable.

Wheat severely damaged by weevils.

Great care should be taken when using any fumigant. Some are highly inflammable and others are dangerous if inhaled or if they come in contact with the skin.

If suitable dusts or fumigants are not readily available, less convenient methods may be applied. The bags could be dipped in boiling water and then dried, or petrol may be used as a fumigant. Petrol forms an explosive mixture with air and no naked lights should be used in the vicinity. The container should be sealed for at least a week.

After treatment, the bags should be stored where there is no danger of reinfestation.

Harvesting machinery and vehicles used for carting wheat should be checked over, any grain removed, and other treatment given if necessary. If all precautions are taken before storage, the risk of infestation will be reduced to a minimum, but the grain should be inspected periodically to ensure that weevils are detected before any severe damage occurs. If weevils appear they should be attacked immediately either by fumigation or dusting with insecticides.

For effective fumigation it is necessary that the container be made gas-tight. In silos, tanks or drums this does not usually present any great difficulty, but when it is desired to treat grain stored in barns, it is necessary to block all places from which the fumigant might escape. If this cannot be done effectively, other methods of control should be applied. Fumigation should not be carried out where there is any danger of affecting live stock or if an inflammable fumigant is used where there is a possibility of the gases being ignited by smokers, lights or fires.

The fumigants usually recommended are carbon bisulphide or chloropicrin at the rate of about 10 lb. of either to 1,000 cubic feet of storage space, the containers being sealed for 48 hours. Carbon bisulphide has a distinct odor and chloropicrin affects the eyes. These factors make it easy to detect their presence and contribute to safety.

Carbon bisulphide is inflammable and no smoking should be permitted in the vicinity.

These fumigant gases are heavier than air and can be applied by pouring over the surface of the grain or, placing them in shallow containers on top of the grain.

Methyl bromide at the rate of 1 lb. to 1,000 cubic feet can also be used for fumigation, but great caution should be exercised. It has little, if any, smell. If one part of carbon tetrachloride is mixed with nine parts of methyl bromide it will give the mixture a distinct odour and make its presence readily detectable. Carbon tetrachloride is obtainable from most chemists.

Grain is a highly-concentrated stock food and occupies less storage space than grass or cereal hays.

Bagged grain can be satisfactorily fumigated under a tarpaulin on a concrete floor, provided that no spaces are left from which the gas can escape.

Weevils rarely attack pickled grain. Grain reserved for seed, therefore, should be pickled as early as possible.

Dusting with Insecticides.

Benzene hexachloride can be used effectively for weevil control in loose grain. Where large quantities of grain are stored in bulk, weevils are usually concentrated near the surface, and control can be obtained by mixing 5 per cent. benzene hexachloride dust into the top layer at the rate of ½ lb. per 100 square feet of surface. For small quantities, 2 oz. of benzene hexachloride per bushel will be effective if mixed thoroughly through the grain.

Weevils will not attack grain stored in bags dusted with benzene hexachloride until the lethal effect of the fumigant has worn off. This may take several months.

Grain treated with benzene hexachloride should not be used for milling for human consumption although it is quite suitable for feeding to stock.

D.D.T. dusts may be used instead of benzene hexachloride, applied in accordance with manufacturers' recommendations.

Rust of Snapdragons

The attention of seedsmen, nurserymen, and home gardeners is drawn to recent advice received that a disease new to Australia and known as antirrhinum rust has been located in the Sydney area. This is a most destructive disease of the popular snapdragon. It affects the leaves, young stems, and calyx and can be identified by numerous spore-forming brown pustules which are surrounded by a yellowish area of leaf tissue. Affected plants wilt and die very quickly.

All seedsmen, nurserymen, and home gardeners are warned against sowing seed or planting seedlings obtained from the Sydney area. As there is evidence that the disease was introduced in a line of seed imported from Germany, all imported seed will now be submitted by quarantine officers to examination by a pathologist before being cleared.

All seed found to be infected will be destroyed. Seed held in stock should be treated with an organic mercury seed dressing at the rate of ¼ oz. per 7 lb. of seed. The seed should be shaken up in a non-metallic container with the required amount of dust.

All growers of snapdragons are asked to watch out for any signs of this disease and, if it is detected, to notify the Department of Agriculture, Treasury Gardens, Melbourne, C.2, immediately.

FARMERS' CLASSES

Dookie Agricultural College

FARMERS, farmers' sons, and others associated with farming pursuits are reminded that the Department of Agriculture has arranged special short courses at Dookie Agricultural College which are proving of considerable benefit to all who participate. The courses are provided at the low cost, of £2 5s. per week, which amount covers board, lodging, and tuition. Lectures are supplemented by special films and free excursions to selected farms and research stations.

Excellent facilities are available for recreation, especially in the sporting field.

Not only are the students brought up to date in their knowledge of the latest practical and scientific developments in the subjects covered by each course, but they benefit tremenduously by meeting farmers from all parts of the State and discussing each others problems.

Farm management and farm bookkeeping are special features in most courses.

One of the most encouraging features of these courses was the splendid response by farmers and their families, for, in addition to numerous forward applications for the courses scheduled, applications have already closed for the young farmers' class in January and the women's class in February.

Full particulars of these courses may be obtained by applying to the Superintendent of Agricultural Education, Department of Agriculture, State Public Offices, Melbourne, C.2.

Tabulated hereunder is the programme of courses to be held during the period, March to July, 1953, inclusive.

No time should be lost in lodging applications.

SHORT COURSES FOR FARMERS, DOOKIE COLLEGE.

	Dates.	Course.	Subjects.
	1953.		
1	10th March to 3rd April, nclusive	Dairy Farming and Pig Raising	Dairying; Pig Raising; Crops and Pastures; Animal Production (including anatomy, physiology, breeding, and feeding); Climate, Soils and Fertilizers; Farm Management; Farm Bookkeeping
2	10th March to 3rd April, inclusive	Sheep Husbandry and Wool Classing	Subjects as for above course except that Sheep Husbandry and Wool Classing are substituted for Dairying and Pig Raising
3	13th to 14th April, inclusive	Tractors and Farm Machinery	General Operation and Care of Tractors; Shearing Machinery and Technique; Care and Use of Dairy Machinery; Cereal Harvesting and Tillage Machinery; Soil Conservation Equipment; Horticultural Machinery; Fodder Conservation Machinery
4	27th April to 8th May, inclusive	Soil Conservation and Land Utilization	Causes of Soil Erosion; Analysis of Soil Problems; Elementary Soil Science; Elementary Surveying; Techniques of Soil Conservation; Soil Conservation Machinery; Land Utilization; Crops and Pastures
5	11th to 13th May, inclusive	Special Course for Poultry Farmers	Feeding, Breeding, Incubation, Brooding, Chicken Rearing, Selection of Stock, Housing, Diseases, Greenfeed Cultivation, Farm Bookkeeping, Poultry Dressing and Packing, Electricity on the Farm, Field Demonstration
6	26th May to 12th June, inclusive	Horticultural Course ..	Pest and Disease Control; Cool Storage; Pollination; Cultivation; Irrigation; Propagation; Pruning; Botany; Climate, Soils, and Manures
7	23rd June to 17th July, inclusive	Dairy Farming and Pig Raising	Subjects as for Course No. 1 above
8	23rd June to 17th July, inclusive	Sheep Husbandry and Wool Classing	Subjects as for Course No. 2 above

DAIRY BUILDING DESIGN

Modern Trends

By R. G. ROY, Senior Dairy Supervisor, and G. H. ABBISS, Dairy Supervisor

Only those intimately connected with the dairying industry are familiar with the advances that have taken place in Victoria in the planning and construction of dairy buildings over the past few years. In this article, with accompanying photographs, the newly-erected dairy and cowshed of Mr. F. W. Doyle, of Mead, are described.

This well-designed and durable dairy building is a great advance on those in vogue twenty or more years ago. The built-up site has simplified drainage problems.

A GOOD dairy building will not in itself ensure a clean high-quality product, but it can greatly assist the farmer in reaching this goal. A high standard of cleanliness may be more easily maintained in a building well constructed, lighted, ventilated, and drained than in a poorly-built, badly-sited structure. A well-planned and constructed dairy building also considerably reduces the time needed for milking operations. The modern dairy building is the result of many years of practical experience and planning.

SELECTION OF THE SITE

Selection of the site should receive very careful consideration. Natural drainage, accessibility to paddocks, and situation in regard to weather must be taken into account. In Northern Victoria, a cowshed with the open side to the north and the dairy on the western end of the building, has given satisfaction. The cowshed open to the north obtains the maximum amount of sunlight which facilitates the drying of the floors during the winter, while location of the dairy on the western end ensures that prevailing winds carry manure dust away from the building.

The milking shed should, if possible, be centrally situated on the farm and accessible to all paddocks. Stock traffic-ways should be kept clear of the dairy end of the building to help keep the dairy surroundings clean and free from dust.

Concrete bricks and pipe bail-fittings, are much more hygienic than woodwork taken to floor level. Extra windows provide lighting and ventilation which ensure the "sweetness" of premises.

The site of Mr. F. W. Doyle's buildings at Mead was built up with loam to a height of 2 feet above ground level. In undulating country it is often an advantage to raise the site, and on flat country in Northern Victoria this is essential. It is impossible, otherwise, to maintain a high standard of hygiene.

When the site is built up sufficiently, all surface drainage falls away from the dairy building, and drainage from the cow-bails flows freely to the required distance.

DESIGN AND MATERIALS

Mr. Doyle's shed has a wide gable roof covering the separator-room, wash-room, and engine-room, the air-space, four double bails, and an exit race at their head. The walls are of concrete brick, which is durable, and also may be kept cleaner than the rough timber walls, taken down to floor level, in the older shed.

The whole of the concrete work in this shed is good, especially the floors. These were well laid and graded. Floors at the dairy end were smoothed with a steel trowel, while the cowshed floor was finished to a fine surface, but one which gives sufficient grip to enable the cows to pass over it safely. Drainage from the bails flows along a flat, open drain at the rear. This continues past the holding yard and empties into an irrigation ditch well away from the buildings.

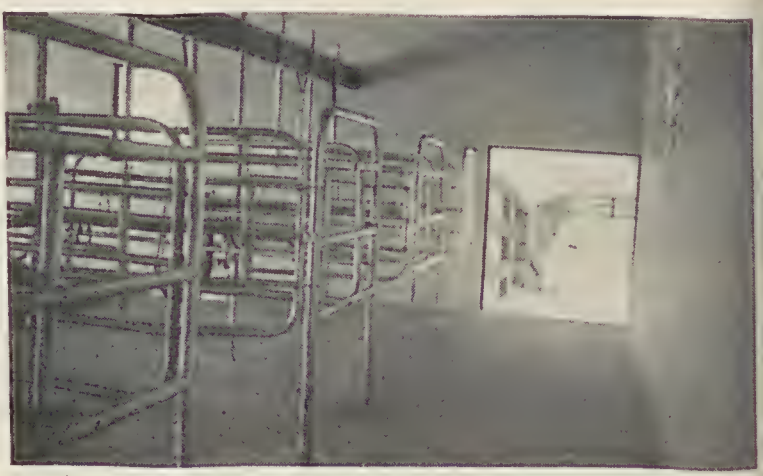
Water supply for the dairy buildings is provided by a windmill from a main irrigation channel, the taps being located at convenient places throughout the building. The floors are flushed with a hose.

For the cooling of cream, a supply of cold water is provided from a drum embedded in the ground and connected to an overhead tank. The pressure of the water in this tank forces the cold water, at soil temperature, from the drum and through the cooler.

Electric light, fitted throughout the building, adds to the workers' comfort. Power for the generator is supplied by the milking-machine engine.

THE DAIRY

At the dairy end of the building, the three rooms open separately to the air-space, and there are close partitions between them. The separator and wash-rooms measure 10 feet by 8 feet and the engine-room 10 feet by 6 feet; all have 8-ft. walls. In the first two, the walls have been cement-



The roofed exit-race eliminates some serious mud problems. It also saves workers from exposure to cold winds when cows are let out of the bails.

rendered to a smooth hard finish. Both rooms have coved ceilings and cylindrical roof ventilators 1 foot in diameter.

Only one window is provided in the separator room, but there are two in the wash room, where extra lighting is required for washing-up operations.

Flywire protects all ventilation points. This ample provision for lighting and ventilation again stands in contrast to the poor lighting and the lack of ventilation and of protection against vermin in sheds of the older type.

INSTALLATION OF EQUIPMENT

In addition to erecting a well-constructed building, Mr. Doyle installed excellent equipment for separating, washing, sterilizing, and the storage of utensils, and in carrying out these improvements, studied convenience of working, and ease in cleaning floors.

Concrete blocks with a smooth, hard surface were provided for the separator and the skim-milk pump. To dispense as much as possible with the use of wood, a metal-pipe vat-stand is bracketed to the wall.

Good lighting and controlled ventilation are provided at the wash trough. The floor is clear of obstructions, and the lower ventilator ensures that it will dry after it has been washed.

In the wash-room, the same care was taken to avoid obstruction at floor level. The steel wash-trough is also bracketed to the wall, under a louvre window which provides ample light for washing utensils and, at the same time, allows the operator to control ventilation.

The dairy. This building, on Mr. F. W. Doyle's farm at Mead, includes separator, wash and engine-rooms, all opening on to the air-space. Fly-wire doors and ventilators ensure aeration and keep out flies.

A rack about 8 feet long and 2 feet wide, constructed of galvanized-iron piping and heavy wire mesh, is provided for the drying and storage of utensils.

DAIRY HEATER

As firewood is in short supply in this irrigation district, and electric power not yet available, an oil-burning type of heater was installed and (most important) this heater is used to provide boiling water at each milking. This is in great contrast to the system, common in earlier times, of heating a kerosene tin of water on the kitchen stove and conveying it to the dairy some distance away. Regulations requiring the compulsory installation of equipment to provide boiling water at the dairy, introduced nearly twenty years ago, have proved to be one of the greatest contributions to the improvement of dairy produce in Victoria.

THE COW SHED

In the now commonly-used type of shed chosen by Mr. Doyle, the cows walk from double bails into a covered race 4 feet wide, and thence to an exit at the end of the shed. The width of this passage-way must not exceed 4 feet; otherwise, cows may turn back and block it.

The metal vat-stand bracketed to the wall and the concrete blocks for the separator and skim-milk pump are non-absorbent, easily cleaned, and offer little obstruction when the floor is washed.

The doorways through the walls are thus eliminated; also the usual boggy outlet in front of the bails is abolished. In addition, this type of building has proved to be more comfortable for the persons engaged in milking.

The cowshed is well ventilated. It is open on the northern side, and also has five louvre windows—three on the back wall and one at each end.

The windows are adjustable and, in addition to providing more light, can be left open in summer for coolness and, in winter, to assist in drying the cowshed floor.

The metal-pipe bails installed by Mr. Doyle are becoming increasingly popular on Victorian dairy farms. Owing to the high cost of timber and wages, metal bails are little more expensive than those made of timber. They have the advantage of being more durable and much easier to keep clean.

The bailing yard, which is placed in front of the cowshed, is concreted and drained. The holding yard is situated at the end of the cowshed.

Manure from the milking-shed and yards is regularly removed to the paddocks by means of a hand-cart.

As a result of careful planning and complete co-operation between the owner, the builder, and the dairy supervisor, this farmer has the dairy buildings and equipment necessary for the production of a choice commodity.

Orchard Jobs for February

Plant green manure crops of peas, lupins or tick beans. Early planting means better growth.
Don't neglect to water stone fruits after harvest.
Watch red scale situation on citrus and fumigate or spray with white oil during this month.
Protect newly-planted trees against damage from rabbits and hares.
Water young fruit trees during dry periods.
Spray canning peaches with dry-mix lime sulphur fourteen days before harvest.
Spray apples and pears affected with mites or red spider with either parathion or H.E.T.P.
Spray Jonathan apples and Williams' pears with "antidrop" spray just before harvest.

Mildura District Horticultural Field Day

THE annual citrus field day was held on the new rootstock trial at Irymple in November.

The Senior Inspector of Horticulture, Mr. C. E. Cole, was introduced to visitors by the President of the Mildura District Citrus Co-operative Association, Mr. S. E. Keenan. Mr. Cole told visitors that the property on which the rootstock trial was conducted had recently been disposed of by Mr. Owen Leng, the previous owner, whom he thanked for his splendid co-operation during the many years he had been associated with this important trial. Mr. Cole said that the State Government had approved of the purchase of land for a new citrus research station in the Mildura district.

Rootstock Investigations

Mr. W. I. Nankivell, Horticultural Research Officer, summarized the progress which had been made on the rootstock trial planted in 1934. The yields during the previous harvest season expressed as bushels per acre for the various stocks are shown in the following table and emphasize the advantage of the Symon's strain of sweet orange over citronelle under conditions prevailing on this property.

Variety.	Rootstock.	Bushels (50 lb. net) per Acre.
Valencia (1951) ..	Sweet Orange	420
	Citronelle ..	280
Washington Navel (1952)..	Sweet Orange	690
	Citronelle ..	410

In September, 1949, new trials mainly to test various sweet orange stocks were planted on a good "Murray Sand" ridge on the same property, and included a total of over 400 trees. There are four scion varieties, Washington Navel, Leng Navel, Valencia Late (Newton bud type), and Leng Sport Valencia.

The rootstocks being used in this main planting were selected from eighteen strains of sweet orange from various parts of the State.

Stocks.	Remarks.
(1) Symons Sweet Orange	This strain has been successful in the 1934 Experimental Plantings
(2) Echuca Sweet Orange	Old, large, healthy, common orange tree growing on Mr. Foster's property in Echuca. The fruit is early ripening and quite good quality
(3) Cox Sweet Orange ..	Stock used by Mr. Bloom in a 40-odd year old lemon planting at Heathmont
(4) Erlandsen Sweet Orange	Large common orange trees planted by Mr. Brien at Wangandary in the Warby Ranges almost 100 years' old
(5) Henshall Sweet Orange	Mr. G. Henshall, Nicholl's Point has old lemon trees in which a sweet orange sucker produced tight-skinned, firm fruit with a deep orange-coloured rind
(6) Jaffa Sweet Orange ..	Mother tree was a large Jaffa tree on Mr. Henshall's property at Nicholl's Point
(7) Valencia Sweet Orange	Mother tree was one of Leng Bros. famous old Valencia Late's which had been selected some years ago as one for special bud selection work
(8) Williams Sweet Orange	Seedling orange tree grown on Mr. J. Williams' property at Irymple
(9) Hill's Sweet Orange..	A row of large seedling orange trees on Mr. G. Hill's block at Merbein

The experimental areas are laid out so that the spray-heads of the overhead sprinkler irrigation system occur at the centre of each eight-tree plot of one particular variety and the eight trees around it are propagated on the eight different strains of sweet orange rootstocks being used for that variety.

Visitors inspecting the new rootstock trial at Irymple.

In addition the relatively few remaining positions are occupied by stock scion combinations of interest to district growers and include other strains of sweet orange as well as trees propagated from the mother rootstock trees.

Bud Selection

Mr. Nankivell also discussed the necessity for care in bud selection in propagation of orange trees, not only because of the quality factor, but also because of the danger of transmitting disease.

The disease psorosis or scaly bark is a serious disease of oranges, causing the scaling of bark on limbs of trees and it may not show up for over twenty years.

Another disease known as scaly butt of trifoliata was of considerable importance where this citrus species was used as a rootstock. Workers in New South Wales had demonstrated that this disease could be carried by both valencias and navels, and if diseased buds were worked on to trifoliata stock the trees were stunted and unsatisfactory for commercial production. The stock developed the scaliness typical of the disease. This particular trouble may not show up for periods of up to eight years.

Mr. Nankivell's advice was to select buds from old trees carrying high-quality fruit, free of disease, and growing on the same stock as that being used for propagation.

Orchard supervisors would be willing to assist any growers or nurserymen who desired assistance in obtaining buds from high quality trees.

Citrus Storage Experiments

Mr. G. B. Tindale, Cool Storage Research Officer, discussed the results obtained in the course of recent storage work.

The development of the common green or blue penicillium moulds is still the main problem in the storage or export of oranges. Experiments in recent years have shown that there are factors apart from careless handling which render oranges highly susceptible to mould attack in storage, and that mould wastage in susceptible fruit could be very greatly reduced by dipping the oranges in a fungicidal dip before packing.

The 1952 storage experiments with navels were designed mainly with the object of confirming previous results.

The effect of the following factors on mould wastage during storage was investigated :—

(a) Oil Spraying versus Fumigation.

Previous results showed that oranges from oil-sprayed trees were very susceptible to mould wastage during storage.

(b) Sweating prior to Packing.

It has often been held that, by sweating oranges for a week or so before packing, the skins lose much of their turgidity and hence can be handled during grading and packing with less risk of skin injury and subsequent mould attack in storage.

(c) Tree "Health".

At picking time, mouldy oranges are often seen in greater numbers on certain trees. It was thought that oranges picked from such trees might develop a high percentage of mould wastage in storage, compared with oranges picked from trees free from mouldy oranges.

(d) Position on the Tree.

When mouldy oranges develop on the tree, most of them are found at or near ground level, while it is rare for mouldy oranges to be found near the top of the tree. It was thought that oranges picked from near the bottom of the tree might develop more mould in storage than oranges picked from near the top of the tree.

(e) *Dipping Oranges in a Fungicidal Dip before Packing.*

Previous experiments had shown that a very great reduction in losses by mould wastage in storage could be achieved if the oranges were dipped before packing in the following fungicidal dip :—

Brytene 1 vol., water 3 vols. plus 4 per cent. borax plus 2 per cent. boric acid.

(f) *Wrapping Oranges in Diphenyl Wraps.*

Reports from overseas stated that considerable reduction in mould wastage in storage could be effected by wrapping oranges in diphenyl wraps.

Mr. W. I. Nankivell, Horticultural Research Officer, addressing field day visitors on scaly-butt virus disease.

The effect of the above six factors was determined in one experiment involving 78 cases of Washington navel oranges all picked in the last week in June from the one grove in the Mildura district. After receiving the various treatments the oranges were stored at 45 degrees and examined for mould wastage after approximately one, two, and three months' storage.

Results were as follows :—

Treatment.	Number of Oranges.	Percentage Mould Loss After—		
		One Month.	Two Months.	Three Months.
Fumigated "healthy" tree, top ..	517	16	26	63
Fumigated "healthy" tree, bottom	549	17	28	62
Fumigated "mouldy" tree, top ..	470	22	31	62
Fumigated "mouldy" tree, bottom	452	24	44	83
Fumigated, not dipped ..	489	14	19	59
Fumigated, dipped	480	5	6	23
Oil sprayed, not dipped ..	761	13	18	51
Oil sprayed, dipped	581	1	2	12
Fumigated, not dipped, sweated ..	536	12	32	58
Fumigated, dipped, sweated ..	542	1	4	14
Oil sprayed, not dipped, sweated..	640	8	19	44
Oil sprayed, dipped, sweated ..	776	3	5	16
Fumigated, diphenyl wrapped ..	580	2	2	6

Conclusions

Oil Spraying versus Fumigation.

Unlike results of previous years, the oil spraying as conducted during 1952 did not bring about increased mould wastage as compared with fumigation.

Sweating.

No appreciable reduction in mould wastage was brought about by the practice of sweating.

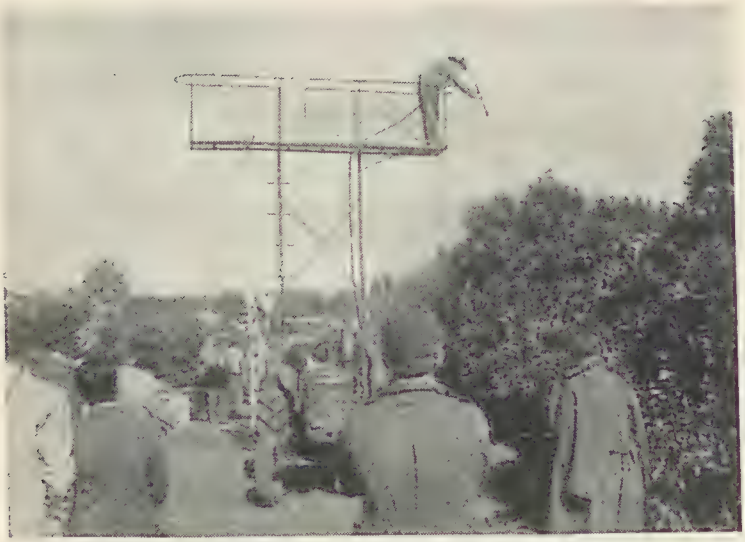
Dipping in Fungicidal Dip.

As in previous experiments a very great reduction in mould wastage during storage was obtained where the oranges were dipped before storage.

The dip was very effective over a period of two months' storage but its effectiveness was on the wane after three months' storage, by which time, however, the oranges had reached the end of their storage life and had lost their flavour although they were then remarkably juicy.

Wrapping in Diphenyl Wraps.

Like the fungicidal dip, the diphenyl wraps were most effective in reducing losses by mould attack during storage. Whilst there was little between the effectiveness of diphenyl wrapping and fungicidal dip covering a period of two months' storage, yet over a longer period of storage, i.e., three months, the diphenyl wraps were more effective.



High tower for spraying simplifies red scale control.

The diphenyl wraps had a very great advantage over the dipped fruit in that the wrapped fruit showed scarcely any shrinkage during storage, so that the wrapped fruit was nearly as tight in the box after three months' storage as when first packed, whereas the dipped and other unwrapped fruits became very loose in the box with long storage.

The diphenyl wraps did not taint the fruit.

Tree "Health" and Position on Tree.

It was found that oranges picked from trees free from mould at picking time developed approximately the same amount of mould in storage as did those oranges picked from trees showing mouldy fruits at picking time, although there was an indication that oranges picked from the bottom of trees showing mouldy fruits developed more mould than oranges picked from near the top of the same trees.

The results showed clearly, however, that oranges from trees quite free from mould at picking time can develop high mould wastage during storage.

Mould wastage is still a great problem in the storage or export of oranges and, in order to reduce losses to negligible proportions, it would appear to be necessary to either dip the oranges in a suitable fungicidal dip before packing or wrap them in diphenyl wraps. The wrapping has several advantages over dipping as already pointed out, but it should be stressed that the value of the wraps has been demonstrated only once as yet, whereas the efficacy of the dip has been shown several times.

Citrus Handling

Mr. W. Harris, Fruit Packing Instructor, emphasized the necessity for care in handling the citrus crop prior to packing. The use of dried fruits sweet boxes for citrus picking containers was unsatisfactory, and resulted in much rind damage. Dump boxes lined with paper should be used and these should not be placed directly on the sandy soil because this enabled grit to enter the boxes and cause abrasion of the fruit.

The apron-type picking bag was the most satisfactory and enabled the fruit to be lowered carefully into the box before the bag was emptied. Picking boxes should not be overfilled because even if they were

Mechanical tent puller for fumigation being demonstrated.

(continued on page 22.)

When Should I Pick My Apples for Cool Storage?

By G. B. TINDALE, B.Agr.Sc., Cool Storage Research Officer

IN Victoria we grow a number of apple varieties which mature in succession from February to May. Each variety ripens over a period of two to three weeks. For most varieties the market can absorb only a small portion of the crop as it matures, the surplus being placed in cool storage. After May, no supplies of apples are available direct from the tree and the market is then supplied wholly with cool-stored apples until the end of the year, when new season's "cookers" become available. The public is then very keen to obtain new season's apples for, after long periods in cool storage, apples lose most of their flavour, and become soft in texture.

A very important factor determining the behaviour of apples in cool storage is the maturity of the apples when they are picked. Growers, therefore, are confronted with the problem of determining just when each variety should be picked to give best storage results. It is generally recognized that poor storage results ensue if apples are picked when they are either immature, or over-mature.

Immature apples will usually shrivel in storage, are devoid of the flavour normal to the variety, and are hard and woody, while some varieties are liable to storage disorders such as superficial scald and bitter pit. Apples picked immature, however, have a long cool-storage life.

The main disability of picking over-mature apples for storage is their very short storage life. In storage they quickly lose what little flavour they have and, at an early date, become soft and mealy. Some varieties develop disorders in cool storage when picked over-mature, i.e., the Jonathan develops Jonathan Spot, while the Stewart will develop skin cracks as the flesh becomes mealy.

There is an intermediate stage of ripeness known as the optimum picking maturity, when a variety has reasonably good eating quality plus reasonably long storage life, and at the same time is not liable to shrivel or develop disorders to any extent when cool-stored. Apples picked at the optimum picking maturity give the best storage results.

The problem is how to determine the optimum picking maturity for each variety. Investigators have been searching for some simple yard-stick which would enable the grower to make a quick and easy determination of the exact maturity of his apples.

Some of the indices of maturity studied are as follows :—

Chemical Tests

As an apple matures, the starch gradually disappears, the acid gradually diminishes, and the sugar content gradually increases. All of these changes, however, are so very

gradual that there is no well-defined point where a correlation between the chemical composition of the apple and optimum picking maturity may be established. Moreover, chemical determinations do not lend themselves to quick and easy field tests, and as a guide for picking maturity, have but limited value to the grower.

Pressure Tests

As an apple matures the flesh becomes softer. An instrument called a penetrometer has been developed in the United States of America to determine the firmness of the flesh of an apple or other fruit. It consists of a $\frac{7}{16}$ inch diameter plunger which is forced a distance of $\frac{5}{16}$ inch into the flesh of the apple after removing a small piece of skin. The force required is measured in pounds by means of a compression spring placed inside the handle of the instrument. It was hoped that with such an instrument one could state at just what "pressure" each variety should be picked to give best storage results.

However, it has been found in tests here and elsewhere that the instrument has only limited application. For instance, there is extremely little change in pressure over the optimum picking period and not until the apple is well past optimum picking maturity is there any steep fall in pressure. Also, the pressure at the optimum picking period for any one variety varies from year to year, and even on one apple the pressure varies from sector to sector. Also there is the personal factor. According to the way the instrument is used so the reading varies. A quick stab gives a different reading from a slow push.

Change in Ground Colour

A much more useful measure of maturity than chemical tests or pressure tests is a measure of the ground colour of the apple. As an apple matures the ground colour changes from green, to green yellow, to pale yellow, and finally to deep yellow when fully ripe.

As a storage proposition, fully ripe (deep yellow) apples are useless. Their storage life is limited to a few weeks only, by which time they will have become mealy and therefore of no market value.

Apples may be picked for storage when the ground colour is green, green-yellow or pale yellow according to the purposes for which they are to be stored.

Culinary apples for instance are picked while the ground colour is green. The apples are then possessed of high pectin and acid content and as such are best for cooking purposes. They are lacking in sugar, however, but that is normally added during cooking.

Culinary apples should be well grown before they are picked, otherwise they are too immature and will shrivel in storage. The housewife normally seeks a "green" variety for cooking and two of these "green" varieties are highly esteemed for such purposes, i.e., the Granny Smith and the Stewart. Both varieties, will of course, gradually turn yellow if allowed to ripen on the tree, but once they lose their green colour their market value falls. Because they are stored whilst the ground colour is still green, culinary varieties have a long storage life.

It is not perhaps generally realized that most of our dessert varieties are also excellent cookers and will keep a long time in storage if picked when the ground colour is still green. At that stage of maturity, however, they are possessed of very little dessert quality, i.e., flavour as characteristic of the variety, and moreover they are then highly deficient in the red blush which the consumer usually associates with dessert apples. Indeed, for years, the more highly blushed (red) an apple was the greater in market value, but of late the outstanding merits of the Granny Smith as a dessert variety have become well known and of course that particular variety has no red blush whatsoever.

For dessert varieties intended for storage to develop reasonable quality, it is necessary to leave them on the tree until such time as the ground colour has changed from green to green-yellow. When picked at this stage they will have a reasonably long storage life, and will retain their flavour for a reasonably long time in storage.

It should be stressed, however, that it is necessary to store only a portion of the crop of a dessert variety to the full limits of its storage life and where a relatively short storage period of say two to three months only is required, then it would be better to pick the apples at a more advanced stage of maturity when the ground colour is changing from green yellow to pale yellow.

The Jonathan variety for instance if picked when the ground colour is changing to pale yellow has a remarkably fine flavour,

and is far superior to that of a Jonathan picked at the earlier green-yellow stage of maturity. For buyers who seek the best in eating quality, the more mature pale yellow Jonathan is unsurpassed, but it must be stressed that because of their advanced stage of maturity their storage life is limited to two to three months after which they lose their flavour and become mealy.

In order to assist growers to determine the ground colour of their apples, colour charts have been prepared. On these are printed squares of colour ranging from green to green-yellow to pale yellow. A hole is perforated in the centre of each plate and the apple, the ground colour of which is to be measured, is placed against the hole and then moved from plate to plate until its colour matches that of a plate on the chart.

These charts are available on application to the Director, Department of Agriculture, Melbourne, C.2.

Date of Picking in Relation to Storage Results

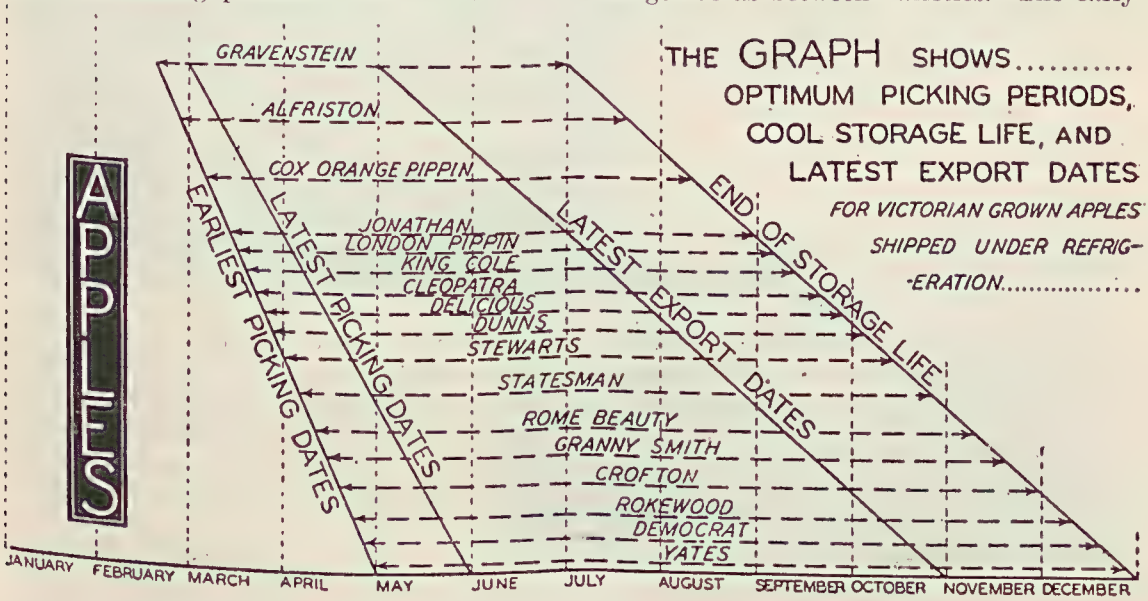
Over the years it has been found that each variety reaches optimum picking maturity for best storage results at approximately the same time each year, just as each variety flowers at approximately the same time each year. It has been found also that the optimum picking period for the earliest maturing varieties is short (not much more than one week), while the optimum picking period for the latest maturing varieties is as long as three weeks. Mid-season varieties have an optimum picking period of two weeks.

The accompanying chart sets out the optimum picking periods for our main varieties as grown in an average district and in an average year. Some districst such as Quantong and the Goulburn Valley are earlier than average districts and the optimum picking periods there would be a week earlier than for average districts, while for elevated late districts such as Stanley, the optimum picking periods would be a week later than for an average district. Likewise some years are "early" years and some are "late" in which cases the optimum picking periods would be up to a week earlier and a week later respectively.

Bearing these reservations in mind, the chart is a simple guide to growers as to when they should pick their apple varieties for best storage results. Sometimes growers are obliged to start picking a variety a little before and to extend the picking beyond the optimum picking period. Dates of picking should then be marked on the cases when stored, and the late-picked fruit having the shortest storage life should be marketed first, while the early-picked fruit having the longest storage life should be marketed last. Indeed, it is a most desirable practice to mark on the cases the date of picking of all varieties, and when each variety is to be marketed, the last into cool store should be the first out.

The Relationship between Variety and Storage Life

It is most important to remember that there is great variation in the length of storage life as between varieties. The early-



maturing varieties have the shortest storage life while the late-maturing varieties have the longest storage life. Consequently, varieties with a short storage life should be marketed first while those with the longest storage life should be marketed last. The chart besides showing the optimum picking dates for each variety also shows the storage life of each variety. When apples are exported to England a shipping and marketing period of approximately two months must be allowed for, so the latest date of export of any variety is determined by subtracting two months from the end of its storage life. The latest shipping dates for the different varieties are also shown on the chart.

MILDURA HORTICULTURAL FIELD DAY—(*continued from page 18*)

to be carted in a single layer, they would probably have to be stacked five or six cases high in the packing shed.

Packing shed managers required employees to use gloves in handling fruit but gloves were rarely used in picking the fruit. This was necessary as also was the clipping of the fruit so that only the stalk button remained. Care should be taken in ensuring that no stalk should remain.

RED SCALE

Mr. C. J. R. Johnston, Entomologist in charge of red scale investigations in the district indicated that the results of the previous year's trials showed the superiority of fumigation. Parathion wettable powder had given results equal to oil but had the disadvantage that it did not control soft brown scale. There was not sufficient evidence to make any change in the present fumigation-white oil programme as outlined in the Departmental spray leaflet for citrus.

For slugs and snails in citrus the bait consisting of 1 lb. calcium arsenate and 16 lb. bran had given best results and was superior to a bait containing B.H.C. The insecticide cryolite was giving most satisfactory results for light-brown apple moth.

Following a display of coloured slides showing various aspects of interest to citrus growers, a demonstration of equipment was given on Mr. L. G. Lloyd's grove, Merbein. A mechanical tent puller for fumigation appeared to have good possibilities for making possible easier handling of the fumigation tents. Another item of value was a tower and catwalk erected over a power take-off tractor to enable citrus trees to be more thoroughly sprayed. An interesting demonstration was also given of various types of spray jets.

Snails in the Orchard

Brown snails are becoming a serious pest in some northern citrus areas where they thickly cluster around trunks and limbs and cause damage to bark, leaves, and fruit. The white snail also is becoming a problem in the Geelong district. The snails are most active during moist, warm evenings in spring, summer, and autumn. To control this pest, spread baits around and on trees where snails are troublesome. To make the baits, mix 1 lb. of calcium arsenate or 5 oz. metaldehyde, and 16 lb. bran with enough water to make a crumbly mixture.

[Horticultural Division.]

Pig and Carcass Demonstration Models

By L. A DOWNEY, H.D.A., Pig Expert

In a report on a survey of the Australian pig industry conducted on behalf of the Australian Meat Board in 1949 Mr. Downey said, "No work designed to improve the quality of pig meat can be successful unless the objective is defined, and the definition made known to those expected to produce it." He recommended that, "declarations be made of the specifications of the meat and carcasses of ide porker and baconer pigs and that those specifications be demonstrated by models, posters, and photographs.

Acting on that recommendation, the Meat Board sponsored and paid for the production of one set of models, as illustrated here, for the use of each State Department of Agriculture.

The models were produced by Messrs. Mei and Picchi of Fitzroy, Victoria, under the supervision of Mr. Downey.

MOST pig raisers have a mental picture of their ideal pig; most bacon curers and pork butchers have their ideals of pig carcasses that suit their trade, and most people know the kind of pork and bacon they prefer to eat.

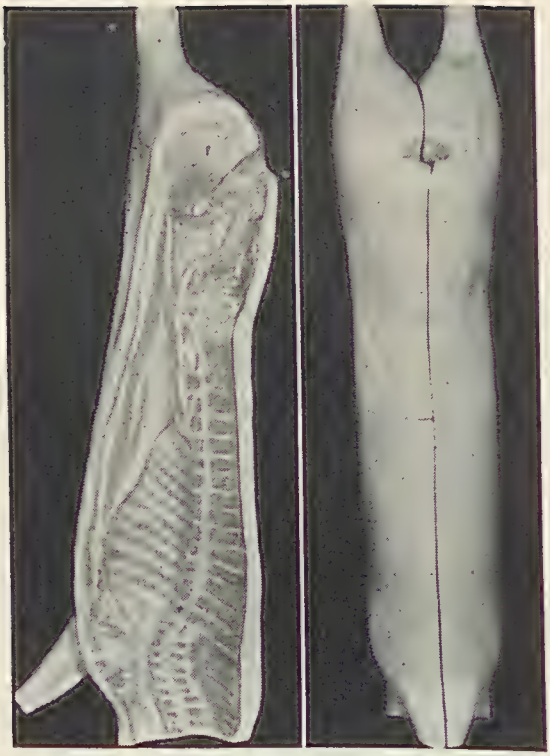
Even after allowing for the fact that farmers want pigs first to suit their farm conditions, and second to suit their customers, many pig raisers have difficulty in trying to appreciate the ideal pig from the consumers' point of view. That is understandable because farmers are mainly concerned with pigs as live animals in pens or paddocks. They do not easily contemplate them as so many pork chops or bacon rashers, each composed of so much fat and lean meat.

Pig raisers see many pigs and much pork and bacon, but they rarely have opportunity to see the pork or bacon that is produced by particular pigs, an opportunity that would help them to a mental correlation of live appearance and meat appearance.

Pig carcass competitions and demonstrations help, but facilities for conducting them are not always at hand. The models

Left.—Three of the models in a setting to show their life-like appearance.

Right.—The well-developed hams and loins can be seen in this rear-end view.



The trimmed side of the carcass of the model pig (left) shows its relative length and the even distribution of its back fat along the centre line. The model of the whole carcass (right) shows the relative narrowness of the pig that produces lean meat rather than fat. The lines indicate the joints of the three pieces of the model carcass.

illustrated here should help to fill that gap. They will be used at field days and lectures.

The model pig is a good reproduction of a particular live pig and the model carcass is a good reproduction of the carcass of that pig.

In measurement, shape, and colour the models are as near as practical to reality. They are made of papier mache, are extremely light, yet very strong. For demonstration purposes they are superior to live pigs and fresh carcasses because they are more easily handled and preserved.

The pig selected for modelling was a Large White sow from the herd of Mr. J. V. Barrow of Bena. Her breeding, feeding, and appearance, as well as the records of her near relatives, all suggested that this pig would yield a carcass of good quality, which she did.

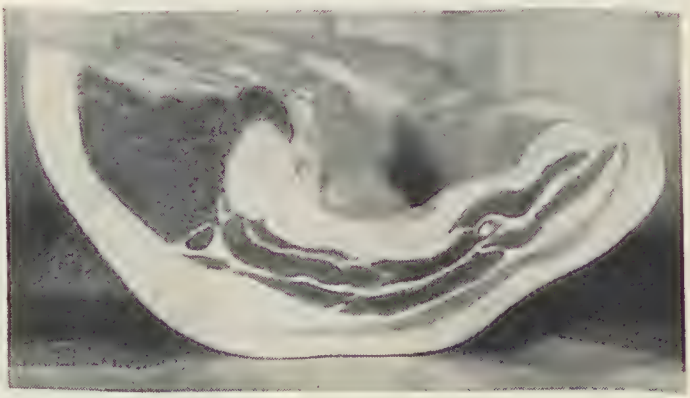
It was necessary to anticipate a good carcass because the live pig was photographed from several points and was measured in many parts just before it was slaughtered. Those photographs and measurements were guides in the building of a model pig in clay. From the clay model, plaster casts were made. These provided the forms for the papier mache models of the pig.

After the pig was killed and dressed the carcass was photographed, then split into two sides which were photographed. Plaster casts were then made of the two sides.

One side was cut across at the last rib to show the amount of lean meat and fat. A piece of this section was frozen and kept for use as a guide, when the fat and lean were being painted on the finished model of the loin section. That allowed very accurate reproduction.

PIG CARCASS APPRAISAL

—	Possible Marks.	Marks Gained.
Leg Length	5	2
Body Length	20	15
Thickness of Back Fat ..	20	19
Thickness of Loin Muscle ..	28	28
Streak	12	11½
Shoulder	7	5
Ham	8	6
Total	100	86½



The model of the section through one side of the carcass at the last rib shows the abundance of lean with a desirable amount of fat in the back and the belly of a good bacon pig.

(continued on page 27.)

LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

THE STOCK FODDER POSITION

LIVE stock owners will face the New Year with some anxiety because of the fodder position. The recent harvest has been the most difficult ever experienced. Few farmers have been able to make sufficient hay and most of this hay has been damaged to some extent by wet weather. Quality and quantity will both be down and, last winter being so severe, few farmers have been able to carry over any reserves.

It is obvious that less than the usual quantity of hay will be on the market this year and that prices may be high. A review of farm costs shows that stock foods increased more in price during 1952 than any other item. This steep rise in prices does not appear to have reached its peak, and some further rises are expected this year. The increases apply to grain and by-product fodders, as well as hay and, with those stock foods purchased in bags, the rises are even greater because the prices of second-hand bags have dropped by about 36s. per dozen.

The wet harvest weather induced many farmers to make silage, and large numbers of buckrakes were in use for this purpose. The quality of much of this silage may be low and wastage high because many of the farmers making silage were inexperienced in the use of this method. In many instances, there was excessive moisture—including rainwater—in the material conserved. Large quantities of juice which contains soluble nutrients have run out of much of the silage made.

The silage will assist in the feeding of dairy cattle during the autumn and winter, but will not make up for the overall shortage of hay.

The late spring and the heavy rainfall which continued through December, 1952, have kept the pastures green, but many of them have too much long growth which could deteriorate before being cut or grazed. In many cases this growth will have become uneatable. It has also prevented new, short, young growth which makes such good grazing.

If the autumn is favorable, dairy farmers and graziers will get through quite well but, as an insurance against a bad autumn and winter, every precaution should now be made to protect all fodder from further weather damage and save it whenever possible.

Those farmers who have insufficient fodder for the winter might give consideration to purchasing some now. This time last year excellent-quality baled grass hay could be purchased for £7 to £8 per ton. By mid-winter, the price had risen to £12 per ton and, by the end of the winter, to £18. These figures may appear high and probably they are, but they are still cheap

for feeding to cattle in comparison with most of the concentrates since, in feeding trials being conducted by the Department with dairy cattle, good-quality home-grown roughages have maintained milk production more economically than purchased concentrates. The competition for concentrates is even greater than for hay because of the demand from poultry and pig feeders, as well as dairy farmers and graziers.

[A. C. T. H.]

CHEAPER ALTERNATIVES FOR WHEAT IN PIG RATIONS

For many years, the cheapest carbohydrate concentrate which has been readily available to stock raisers has been wheat. At the beginning of December, the price of wheat was increased by 1s. 11d. a bushel. The wholesale price of bulk wheat rose from 12s. to 13s. 11d. a bushel. Retailed in bags, wheat can be bought as cheaply as 16s. 6d. a bushel. At this price, each food unit (starch equivalent) costs 4·6d. per lb.

It is fortunate that other sources of carbohydrate are available more cheaply. Pollard, which can replace all the wheat in pig rations on a pound-for-pound basis can be purchased at 4s. 6d. a bushel. At this price, each food unit costs 3·85d. Oats also are cheaper than wheat, but, as oats are more fibrous than pollard, they should not form more than one-third of the meal ration for pigs. With oats costing 8s. 4d. a bushel, each food unit costs 4d.

In calculating the value of a food unit in these feeds, the price per bushel has been divided by the number of starch equivalents in a bushel of the feed. This means that the relative values of these feeds may be easily calculated by dividing the price per bushel of wheat by 43, oats by 25, and pollard by 14. In other words, if wheat is obtainable at 16s. 6d. a bushel, pollard is cheaper if it is less than 5s. 4½d. a bushel, and oats are cheaper if less than 9s. 7d. At these prices all three are comparable.

[A. D. North, B.Agr.Sc., Live Stock Research Officer.]

GROWING PULLETS

January may well be termed the most critical period for young growing poultry stock. Normally, it is hot and dry, and most debilitating for partly-grown stock. The early-hatched pullets are then almost fully grown and their development is not seriously retarded by the hot weather, but late-hatched pullets which lack constitutional vigour are highly susceptible to diseases such as coccidiosis which, in conjunction with the hot, dry weather, retard growth. Retarded growth increases food costs, and is not conducive to high egg production. Growth is usually slow during summer, but varies in relation to the number of hot spells experienced.

Location and general lay-out of farms have an influence on rearing during hot weather. Birds that have access to well-ventilated sheds and shade trees in well-grassed runs do much better than those exposed to hot sunlight and scorching winds in bare, open yards.

The condition of drinking water is very important as young growing stock appreciate nothing better than a cool, refreshing drink during hot weather. Birds have an aversion to hot or tepid water. It restricts the intake of water and lowers food consumption.

Water pipes should be buried well under ground in rearing paddocks, and drinking troughs protected from the sun by fixing canopies or roofs over them. Ample perching space should be provided in the chicken houses, and red mites kept under control. All forward birds should be transferred to their laying quarters to relieve the pressure in the rearing paddocks, and overcome the bullying that occurs when forward birds are permitted to range with the slower-maturing ones.

Fowls that have suffered from coccidiosis mature rather slowly and this is further aggravated by extended spells of hot, dry weather during the growing period.

The most effective method of dealing with retarded growth in young stock, is to confine the breeding season to about ten weeks from 1st July to mid-September. This gives ample time for birds to grow sufficiently before the hot weather sets in.

Birds hatched in the above period usually have access to liberal supplies of fresh young greenfeed, and the weather, being cool and invigorating, is conducive to strong, vigorous growth among the birds.

When the breeding season is limited to ten weeks, it is possible to rear and transfer the young stock to their laying quarters

by February. This gives the paddocks about five months spell prior to the next breeding season.

[M. D. HALL, Poultry Expert.]

BEEKEEPING

When moving the apiary any distance, care has to be exercised in packing populous colonies and more especially care is needed in the use of the migratory cover. It is advisable to reduce populous hives before migration, as it is much better to arrive at the destination with a normally strong colony in good condition than with a populous one suffering travel damage and injury.

Now that the red gum flow is about finished, it is possible in favoured districts to reduce populous colonies by increasing the number of colonies and building them up on stringy bark and other early autumn flows.

A three-frame nucleus can be drawn from the over-populous colonies and movement (or migration) of the original colony can be carried out during daylight, as the flying bees will return to the nucleus which is left on the old stand. Queen cells can be raised or laying queens purchased in preparation for the increase.

By making an increase, two things are achieved; first, the populous colonies have been assured of safe movement by being relieved of their surplus bees; and, second, an early increase has been made with ample time for the nuclei to build up before the autumn flow finishes.

PIG AND CARCASS DEMONSTRATION MODELS—(*continued from page 23*)

From the plaster casts of the two sides of the carcass papier mache models were made. One of these was cut across at the last rib and the three sections of the carcass were made to be assembled into one piece or taken apart to show the inner view of one side and the composition of the carcass across the loin.

The carcass was appraised by the "Smithfield" method, which is generally accepted as interpreting the preferences of the majority of consumers of pig meat. It favours pigs with abundant lean meat, enough but not too much fat, thick and lean streaky belly, relatively long middles, heavily-developed hind-ends, lightly-developed fore-ends, and short legs.

The pig used for modelling was slaughtered when 171 days old, its chilled, dressed carcass weighed 184 lb. and on appraisal the carcass scored as shown in table on previous page.

That score of 86½ marks put the carcass in the highest class, equal to some of the best carcasses appraised in open competitions.

The assistance of the Gippsland Co-operative Bacon Curing Company, Dandenong, in connexion with this work was greatly appreciated.

Agricultural Lime—Brands Registered for 1953

By F. H. WILLIAMS, M.Sc., Deputy Chief Chemist

THE list of registered agricultural limes for 1953, as published in the *Victoria Government Gazette* in December last, appears hereunder. Every brand of lime sold in Victoria for agricultural purposes must be registered with the Department of Agriculture, and the bags must be labelled to show brand, manufacturer's name, analysis, weight, and degree of fineness.

This year's list is smaller than that for 1952, only nine brands appearing. Additional brands may, of course, be registered during the year. Prices have risen in practically every case, the increases ranging from 3s. to almost 30s. per ton.

The term, "agricultural lime," includes burnt lime (calcium oxide), slaked lime (calcium hydrate), and ground limestone (calcium carbonate), each containing a different content of calcium oxide (as shown by the analysis). The actual form used on a soil requiring lime is not very important, as long as equivalent amounts are used. A purchaser who has simply asked for "lime" need not feel concerned if he receives a form different from that obtained on a previous occasion, as long as he understands the relative values of the different forms.

Some farmers have access to limestone deposits which they wish to use on their properties. Limestone, to be effective, must be finely ground. If the deposit is fairly fine, soft, and crumbly, and analysis shows a satisfactory calcium carbonate content, such limestone will probably be suitable for use; but, if the deposit is hard and requires grinding, its utilization will probably be impracticable.

Inquiries regarding brands of agricultural lime, and the use of lime on soils, should be addressed to Chief Chemist, State Laboratories, Gisborne-street, Melbourne, C.2.

LIST OF AGRICULTURAL LIMES REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE AGRICULTURAL LIME ACT 1934 (No. 4271) FOR THE YEAR 1953.

General Description.	Brand.	Calcium Oxide.	In the Form of—	Equivalent to Calcium Carbonate.	Magnesium Oxide.	In the Form of—	Degree of Fineness. Material Passing Through a 20-mesh Sieve.	Price per Ton in 11-ton Lots.	Manufacturer.
		%		%	%		%	£ s. d.	
Ground Burnt Agricultural Lime	Lilydale, No. 2	72·8	Mainly oxide	130·00	5·00	Mainly oxide	60·00	5 12 10	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
" " "	Kawa Oxide	83·0	"	149·7	1·20	"	80·00	8 0 6	P. Alkemade and Sons, 535 Little Lonsdale-street, Melbourne
Agricultural Slaked Lime	Lilydale ..	60·00	Hydroxide and carbonate	107·23	5·0	Mainly hydrate	78·0	3 13 4	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
" " "	Cave Hill ..	60·0	"	107·23	5·00	"	68·0	3 13 4	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
Ground Limestone	Lilydale ..	46·45	Carbonate	82·95	5·00	Carbonate	92·0	3 12 0	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
" " "	Lara ..	38·0	"	68·0	1·0	"	80·0	2 10 0	Lara Fertilizer and Lime Co., Lara
" " "	Kurdeez ..	50·40	"	90·00	1·50	"	80·00	2 0 0	Victorian Agricultural Lime Ltd., 422 Collins-street, Melbourne
" " "	Walker's ..	33·17	"	60·00	0·79	"	65·00	3 5 0	Walker's Waverley Lime Works, Lara
" " "	Moyne ..	45·9	"	82·0	1·0	"	97·0	3 0 0	Moyne Portland Cement Ltd., Port Fairy

Melbourne, 27th November, 1952.

W. R. JEWELL, M.Sc.,
Chief Chemist.

MACORNA LAND-USE SURVEY

By K. R. GARLAND, B.Agr.Sc., Field Agrostologist

The first part of this article appeared in the November issue of the *Journal*

The land-use survey of the Parish of Macorna entailed investigation of area, topography, distribution of irrigation districts, climate, soils, water usage, grading efficiency, areas of crops and pastures, distribution and area of salt-affected land, fertilizer programme and fodder conservation, all of which were discussed in the first part of this article.

In this second part, the discussion is concerned with mechanical equipment, subdivision, drainage, types of stock, stock diseases, and weeds.

M. (*a*) Equipment

For 30 farms, 16 tractors and 13 horse teams (4 to 6 horses) were available for work. There were, however, four occasions on which both a tractor and a horse team were present on the one farm, and also one occasion on which one farm possessed two tractors. This, then, leaves six properties on which no method of traction existed. Approximately 50 per cent. of farms were equipped with sufficient machinery to carry out routine irrigation-property work, e.g., ploughing, cultivating, grading, sowing. Another 25 per cent. had some, but not all, of this equipment, while the remainder had little or no machinery at all.

M. (*b*) Milking Shed

Over 90 per cent. of the dairy farms used milking machines. Of these, the great majority used 2 or 3 units, but one 6 and some 4-unit stands (2 cases in 16) were encountered.

Also, approximately 50 per cent. of farmers practised bale-feeding; for most, this amounted to a few lb. of bran per cow per day, but others used oaten chaff or meadow hay. Where hay was available for supplementary feeding, paddock feeding was generally preferred.

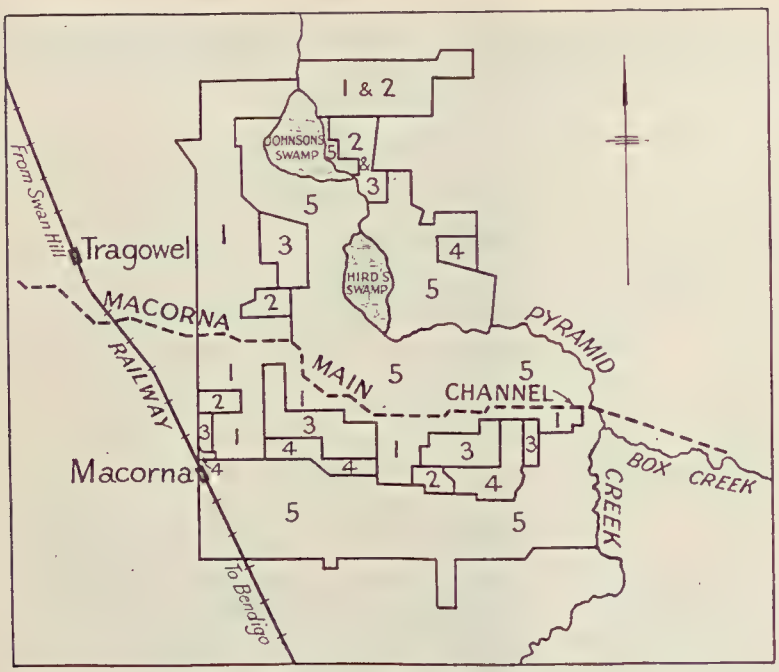
N. Rabbits

Rabbits were thickest near creeks, timber reserves, channels, and dillon bush (*Nitraria Schoberi*) infested country. All of the survey area carried, at the time of survey, its share or more of the State's rabbits. Where rabbit concentration was high, however, areas which must have approached the worst-infested in the State could be found. Most of the landholders in these positions regarded the rabbit as their No. 1 contender for their land's production. On farms where up to 25 per cent. of the area was badly salted, the rabbit was still regarded as the more serious menace to farm economy.

Methods of control used were digging of burrows, flooding of burrows (along channels), baiting (poison trails), maintaining large dog populations, clearing the dillon bush, encouraging visits of travelling trappers, shooting, and, on occasions, fumigating. It is thought, however, that the natural breeding rate of the rabbits was keeping pace with the death-rate under these systems using the available manpower. The ultimate rabbit population was, therefore, not much changed.

In the summer of 1950–51, however, myxomatosis reached the district following the "liberation" of the virus further up the Murray. Although its effect was said to be patchy, it caused widespread destruction of rabbits.

The summer of 1952–53 will provide a real testing time for the disease; with artificial transfer of infected rabbits from district to district now freely occurring and farmers keen to make the most of this new power, myxomatosis will be given ample opportunity to show its worth. It is to be hoped that those who doubt the permanency of the disease's effect on rabbits, will be proved incorrect in their belief.



Map of Macorna parish showing boundaries of drainage divisions as rated by the State Rivers and Water Supply Commission.

O. Sub-division

Twenty-five farms were divided into 304 paddocks—an average of 12·2 paddocks per farm and approximately 45 acres per paddock.

Paddocks carrying natural pasture and/or salt-affected land would, of course, be larger than the average, even twice the area on some cases. Improved pasture paddocks would be smaller, some carrying sub. and rye containing only 5 acres.

The condition of fences is, in general, only fair. Many have lost their sheep-proofing qualities and few were ever lamb proof. Recent good prices for farm products are, however, enabling many farmers to replace their old fences.

P. Drainage

The attached map shows the area of the survey divided into categories on the basis of drainage facilities. These categories are the Drainage Divisions of the State Rivers and Water Supply Commission. The definitions of the five divisions are as follows :—

1st Division.—All holdings of which not less than two-thirds of their areas are, or can be, by the construction of internal drains, effectively drained directly into the Commission's system.

2nd Division.—(*a*) All holdings not included in 1st Division, more than half of which, but less than two-thirds is, or can be by the construction of internal drains, drained directly into the Commission's system, and the balance of the holding is within 1 mile of a drain of the Commission's system. (*b*) All holdings which are, or can be by the construction of internal drains, drained directly into the Commission's system, but which are adversely affected to a substantial degree by increase in liability to flooding by reason of the construction of the Commission's drains.

3rd Division.—(*a*) All holdings, the nearest portion of which is within 1 mile of a drain of the Commission's system and can be drained thereto, or holdings which receive protection from intercepting drains. (*b*) Lands which cannot be drained to Commission's drain, but which receive benefit from Commission's works preventing water from reaching the lands.

4th Division.—All holdings not in 1st, 2nd, or 3rd division, which, as a result of any of the Commission's works, receive drainage benefits or protection.

5th Division.—All other lands within the irrigation district boundaries.

The decrease in the sufficiency of the drains as one passes from 1st to 5th division lands is obvious from the above; certainly those properties rated as 4th or 5th division are in need of better facilities. Lands of the last division are, of course, virtually no drainage areas from the Commission's viewpoint. At least two landholders in this position have, however, constructed quite sizeable drains of their own to take drainage waters to the Pyramid Creek. A recent dredging of this creek has resulted in the lowering of the full-supply level (it is used as a water-carrier)

Land "laid out" for irrigation by ploughing up checkbanks. These bays are of excessive (i.e., greater than 8 to 10 chains) length.

by a foot or so thus rendering more efficient any drains which might run to it from land to the south. The Calivil Creek receives drainage waters from the "half-drained" western and south-central portions of the area; this creek later joins the Nine-mile Creek which is passed by culvert under the Pyramid Creek and thus on to feed into the Barr Creek.

The Commission's plans for the future include construction of more drains for those areas least served now. Existing drains are, however, not used to their fullest capabilities due to the fact that many farmers are slow to set up satisfactory systems of internal drains on their properties. Cases where excess irrigation water runs into road side-cuts or swampy areas and there remains for considerable times, when Commission drains to which contact could be made are nearby, illustrate this point. The importance of the rapid escape of all surplus waters has already been stressed in "Section J,. Salt".

Q. Breeds of Stock

(*a*) *Sheep.*—Merinos and Comebacks account for approximately 50 per cent. of the sheep population. The remainder are primarily Border Leicester-Merino cross-breds; Corriedales and Romney-Merinos have fair representation; other Down-breed crosses do occur. Fat-lamb sires used are chiefly Dorset Horns, Border Leicester, and Romneys, the former being the most common.

(*b*) *Cattle* (1) *Milking.*—Jerseys are the most common pure-bred cow, Shorthorns are next. Approximately 40–50 per cent. of the herds are of cross-breds, usually Jersey-Shorthorn crosses. In these cases, the owner is often breeding towards one breed, and this is more commonly the Jersey. One or two herds of Guernseys occur in the area. (2) *Beef.*—Herefords, Shorthorns, and Red Polls were well represented.

R. Diseases

In sheep, pregnancy toxaemia, pulpy kidney, milk fever, worms, fluke, Blowfly strike, bone chewing (Calcium-phosphorus imbalance) occur; in cattle, there is abortion (contagious and from other causes), fluke, worms, milk fever, and bone chewing. In both sheep and cattle, odd cases of infertility are to be found.

But the significant feature regarding the disease status of the area is that it is no worse than the average for the Kerang-Swan Hill-Cohuna-Pyramid zone. In fact, in some aspects, it is superior. This opinion was given by the district veterinary officer of the Department of Agriculture. The possibility of a high incidence of disease, due to poor husbandry methods or soil deficiencies, being an important factor in lowering production in the area, is, therefore, non-existent.

S. Weeds

Field weeds occurring in the area included Saffron thistle (*Carthamus lanatus*), Malta thistle (*Centaurea melitensis*), Shore thistle (*Carduus pycnocephalus*), heliotrope (*Heliotropium europaeum*), Horehound (*Marrubium vulgare*), Hedge Mustards (*Sisymbrium spp.*), Boxthorn (*Lycium spp.*), and Dillon bush (*Nitraria Schoberi*).

Boxthorn and dillon bush are important because of their rabbit-harbouring properties. Boxthorn occurs along fence-lines, sometimes as "hedges" and, in this role of weatherbreak, is of some value on these sparsely-timbered plains.

Of the other weeds mentioned, only the Saffron and Malta thistles are of much importance, and even they are far from being possible obstacles to normal farm production.

Another small weed which does occur is Lemon Beauty-heads (*Calocephalus citreus*). This weed is found on poorly-drained areas of low fertility and is not likely, therefore, to be a serious competitor with pasture sown on well-graded and manured land. In general, the area is considered to be relatively weed-free.

Channel weeds are similar in this area to those found throughout the north of the State; the principal species are Cumbungi (*Typha spp.*), Rushes (*Juncus spp.*), "Nut grass" (*Cyperus vegetus*), and Silt or Water-couch grass (*Paspalum distichum*), and Docks (*Rumex spp.*).

The majority of farmers make use of the State Rivers and Water Supply Commission's excavators, when they are available for private channel work, to clean the largest of the farm channels. Channels are thus cleaned once a year or once every second year. A local contractor, using old Commission equipment, is also now available for this work at rates approximating those charged by the Commission.

Small farm channels (paddock channels) are kept operative by the use of ploughs and scoops or shovels. Local rotary hoe contractors are also available for the work.

T. Stocking and Production

Figures given in the column for mixed farms in the table should, perhaps, be treated with caution as they are based on only a few cases. A comparison between the dairy and sheep (and beef) properties, however, seems to indicate a higher efficiency in

SOME STATISTICS IN RELATION TO THE AREA SURVEYED.

Item.	Nature of Farm.			Totals.
	Dairy.	Sheep and Beef.	Mixed.	
Number of farms	15	11	4	30
Area acres	4,490	10,125	2,549	17,164
Manpower	22	20	5	47
Water right acre feet	1,381	2,250	546	4,177
Sales quota acre feet	570	450	323	1,343
Total water acre feet	1,951	2,700	869	5,520
Cows (milk)	623	..	154	777
Young cattle	213	..	48	261
Merino and Comeback sheep	..	3,250	750	4,000
Cross-bred sheep	..	3,700	430	4,130
Bullocks (six months fattening)	..	154	..	154
Cows (producing vealers)	..	85	..	85
Fat lambs/year	..	3,400	600	4,000
Stock units (dry sheep)	10,200	10,400	4,000	24,600
Area/man acres	204	506	509	365
Acre feet/man acre feet	89	135	174	118
Acre feet/cow* acre feet	3·1	4·3	3·5	3·7
Area/cow* acres	7·2	16·0	10·6	11·4
Area/dry sheep acres	·44	·97	·64	·76
Stock units/farm	680	945	1,000	820
Stock units/man	464	520	800	523

In the Table 1 stock unit = 1 dry sheep; 1½ stock unit = 1 wet sheep and lamb; 7 stock units = 1 bullock or young cattle; 14 stock units = 1 milking cow or 1 cow producing a vealer and the calf.

* This refers to *milking cow* equivalents—allowance is made for one-seventh of the stock units to be young cattle. Therefore, milking cow equivalents = $\frac{6/7\text{ths} \times \text{Stock Units}}{14}$

the use of water on the smaller farms under dairying than on the larger ones carrying sheep. This is based on the figures 3·1 acre feet per cow and 4·3 acre feet per cow equivalent for the respective farms. This estimated "water efficiency" as obtained here for the sheep farms, will depend, however, on the number of sheep regarded as equivalent to one milking cow. In the table 1 cow = 14 stock units and 1 wet ewe = 1½ stock unit, i.e., 1 cow = 9·3 ewes and lambs. If 12 stock units is regarded as equal to 1 cow (i.e., 1 cow = 8 ewes and lambs), then the water efficiency ratio for the sheep and beef section becomes 3·0—or virtually the same as the dairy section.

The cow-sheep ratios as used in the table are based on the respective starch equivalent requirements for 2 gallons at 5 per cent. cows and 100 to 130 lb. sheep (ewe and lamb). See pages 22 and 28 of "Foods and Feeding" pamphlet by A. C. T. Hewitt, M.Agr.Sc. This pamphlet may be obtained, free of charge, on application to the Director, Department of Agriculture, Treasury Gardens, Melbourne.

The contention that water economy is superior on the smaller dairying units is thus dubiously illustrated, but field observations agree with this theory since, on the larger properties, there is a lower percentage of pasture improvement and a a greater tendency towards irrigation of native pastures.

Indications from local herd test association secretaries are that the average butterfat yield per cow per annum in the survey area would approximate 200 lb. Fleece weights for crossbred and Comeback ewes would be in the vicinity of 8½ lb.; average Merino ewe's and wether's fleeces would weigh approximately 8 and 11 lb., respectively. Wethers account for almost quarter of the Merino population.

Some practices in the sheep industry which merit revision are—

(1) retention of slow-fattening or late-ewe lambs to become flock ewes (crossbreds);

(2) overstocking of properties carrying Merinos, apparently with the idea that they do not need to be well fed to produce their maximum of wool;

(3) too little attention paid to wool quality of fat-lamb sires, particularly Dorset Horns;

(4) lack of interest in flock sire's ancestory or valuation of ram based on performance of one outstanding ancestor.

In addition to the stock listed above, several hundred pigs were carried on the 30 farms involved.

Annual production from these farms, which cover 17,000 acres, occupies 47 men and requires the use of 5,500 acre feet per year. The production can be summed up as follows:—

(1) Butterfat, 160,000 lb.

(2) Fat lambs, 4,000.

(3) Wool—

35,000 lb. Merino (and Comeback);

35,000 lb. crossbred.

(4) Sundries—

(*a*) fat steers approximately 200;

(*b*) vealer calves (beef breed), approximately 100;

(*c*) dairy calves, several hundred;

(*d*) pigs (several hundred) as baconers mainly and a few back-fatters.

SUMMARY

A. Area

Major portion of the parish of Macorna, County of Gunbower. Involves 42,000 acres.

B. Topography

Very flat plains disected by two creeks—Pyramid and Calivil.

C. Irrigation Districts

Three involved, parts of following:—

(i) Kerang (1 in 4);

(ii) Tragowel Plains (1 in 7);

(iii) Cohuna (1 in 2) (only very small section).

D. Climate

Winter rainfall area; hot, dry summers. Average rainfall (annual) approximately 14 inches. Effective rainfall 5½–6 months of year. Mild winter temperatures.

E. Soils

Majority shallow clay loams overlying clay; very permeable. More loams of lower permeability towards south.

(*continued on page 36.*)

THE DAIRY FARM

Afterthoughts on Silage

THE widespread interest in silage making during the harvest season just ended was not entirely due to the wet weather, which was not favorable to the conservation of grass hay, though this did have some influence also. The interest arose chiefly from the knowledge that new methods of making the silage had become possible and that these methods removed from the task much of the hard work formerly associated with it.

The results of silage making by the new methods in Victoria will not be fully known until the various stacks and pits are opened for feeding out to stock, but many farmers will have already formed some impressions as a result of their experiments. Those who got their material in quickly and without difficulty will doubtless make silage again. But there would have been failures and difficulties as well as successes. Those who have experienced the difficulties should not be too discouraged, but should endeavour to learn by their mistakes and try again.

Experiences with Buckrakes.

A special effort has been made to see buckrakes in action and to learn everything possible about their use from those with practical experience. But the silage making season is short, and it has been possible to make contact with only a small proportion of all buckrake users. Any who have helpful hints to pass on from their own experience are requested to do so, in order that this knowledge can be passed on to others who may wish to make silage with the buckrake next season.

Some teething troubles were experienced in the use of this implement. Of several makes now on the market locally, some were being used for the first time, and faults developed despite the tests made on them by their manufacturers. The firms concerned have watched their operation closely, and no doubt will modify their implements accordingly for the next harvest season.

The vendors of tractors might well also prepare for the future. Buckrakes as we know them at present are suitable for operation only on a few makes of tractor, and there have been some disappointments for those who bought buckrakes only to find that the tractors they owned were not suited to them. The first requirement, of course, is hydraulic lifting gear, but there is the further limitation that not all hydraulic linkages are suited

The rear-mounted buckbrake operates on a tractor's hydraulic lifting gear. It has taken the hard work out of silage making and is rapidly gaining in popularity.

to buckrakes. Two possibilities are open to tractor makers—the provision of suitable hydraulic gear or the design of a buckrake which can be operated by the power take-off. This latter, however, is less likely to provide a satisfactory solution than the fitting of hydraulic gear.

Other smaller differences in the equipment used, it seems, can have quite a bearing on the ease of working. For instance, one type of tractor can be equipped with tyres of two alternative sizes differing by 1 inch and, on a ramp of green material the performance of the tractor is made vastly different if the larger-sized tyre is fitted.

Various opinions have been advanced as to whether a tractor climbs such a ramp more easily when driven forward or when in reverse. This will, of course, be influenced by the gear ratio for the reverse gear and the lowest forward gear in the particular tractor in question. To test this, it would be necessary to use a tractor in which both gears had the same ratio of wheel speed to engine speed.

Some users claim that there is no need to reverse the tyres so that the treads will grip more effectively when the tractor is climbing backwards, and that there is no need to use grips, while others have suggested that both these things are of assistance. The difference could be due to the fact that some have built their ramps more steeply than others have done.

Buckrake users seem to have been very conscious of the risks involved, and have taken precautions for the safety of men and tractors. At the time of writing no serious accidents have been reported, but there have been instances where a tractor wheel has slid over the edge of a ramp and a second tractor has been needed to haul the first one back on to the stack.

The Forage Harvester.

The forage harvester represents a capital outlay which could not easily be justified on a dairy farm of ordinary size; nevertheless, a few have been in use. The chief difficulty seems to be that of emptying a trailer full of chopped green material, as this clings together very strongly after it has been shaken down during transport. Information from users of the forage harvester on other problems and their solutions associated with this implement would also be appreciated.

Pasture Management Through Silage.

Under some circumstances silage making is more than fodder conservation. In some districts—and this year in almost all districts—the cutting of silage is followed by a strong growth of aftermath pasture which can provide further grazing for the cows. In this way it solves the problem presented by pastures which "get away" from the herd in the spring flush and run up to seed. At the same time it lengthens the harvesting season and ensures that all paddocks saved for hay or silage can be cut before overmaturity has robbed them of food value.

Reliance has also been placed in silage making this season by some farmers as a method of weed control, the object being to cut the paddock in question before the weeds form seed. This argument is valid, but it must be remembered that inferior material will not make superior silage.

[K.M.S.]

The Young Farmer

During the past eighteen months I have raised many questions in this column, and was recently challenged by a representative of a young farmers' club who stated that his club wished to know when answers to all the questions asked would be published.

In the quiz age in which we live, perhaps we tend to expect a clear-cut and final answer to every question, an answer decided upon by some authority which carries so much weight that its accuracy and finality cannot be disputed.

The questions posed in this column are not the stuff of which a quiz is made. They do not refer to past events but to living problems of the present time and, in the main, to problems for which the solution is not yet fully known. They should not be approached by readers in a spirit of competition, to see how many of the answers they know or can guess. Rather, they are intended to initiate lines of thought which the reader can follow further through his own observation and his own thinking. They are an attempt to teach young farmers that they can learn a great deal more by a little reading and observation plus a lot of thinking about the things so gleaned than they can learn from a great deal of study plus the mental indigestion which usually follows the attempt to absorb and retain large masses of the ready-made thoughts of others.

To those who have a farming problem I can commend the method usually attributed to Socrates. This consists of writing down all the questions associated with the problem, and then attempting to answer them one by one.

This may not lead directly to the desired solution. It may merely lead to the writing of further questions, but at least it does define the problem. When this is done books and advisory services can be consulted more effectively. Most of the questions asked in this column are the first part of such a process, and the answers should be sought through thinking and, in a club, by debating. But do not be disappointed if the debate tends to raise even more questions rather than provide answers. Dairy farming is a complex thing, full of change and progress, and we owe a great deal of our progress to farmers who think for themselves about their problems.

An attempt may be made later to answer some of the questions raised in these notes, but it is quite probable that the answers will consist of further questions.

[K. M. SILLCOCK.]

MACORNA LAND-USE SURVEY—(*continued from page 33*)

SUMMARY—*continued*

F. Method of Survey

Primarily by interviews with section of landholders of district.

G. Water Usage

For the area as a whole the water right approximates 1 in 4 and the sales quota 1 in 10.

H. Grading

Not up to desirable standards. Crab-holey soils makes two workings essential.

I. Crops and Pastures

Subterranean clover and rye grass almost 25 per cent.; crops almost 10 per cent.; permanent pasture 4 per cent.; remainder unimproved.

J. Salt

Northern two-thirds of survey area salted. As a whole approximately 20 per cent. area affected—sterile ground and halophytes. Reclamation possible in some cases.

K. Topdressing

Half-bag per improved acre per annum is overall rate—should be increased.

L. Fodder Conservation

Very poor, usually only considered as an offset to the next winter's lull in pasture production. Droughts rarely provided for—particularly necessary, however, in southern 1 in 7 Tragowel Plains Irrigation District.

M. Equipment

Generally fair to good, but occasionally totally lacking. Milking machines very common.

N. Rabbits

Once very bad, now less severe due to myxomatosis. Farmers should not, however, abandon their normal rabbit-control methods and expect myxomatosis to do the whole job, but rather treat the disease as a method of making a "clearing cut" which must then be followed by other controls to obtain a total elimination of rabbits.

O. Sub-division

Not intensive.

P. Drainage

Drains overlooked when irrigation first installed, but now reasonably well served. Room for improvement in number of internal farm drains cut. Also, cleaning of blocked drains sometimes overlooked—important duty of both landholder and the State Rivers and Water Supply Commission.

Q. Breeds of Stock

Sheep.—Merino, Comeback, Merino x Border Leicester or Romney, Corriedales, Dorset Horn, Romney and Border Leicester sires.

Cattle.—Jersey, Shorthorn, and Jersey-Shorthorn cross. Some Red Polls, Guernsey, Hereford.

R. Diseases

Not excessive.

S. Weeds

Relatively weed-free area. Thistles chief weeds.

T. Production and Stocking

Not yet to maximum level. Grading, pasture improvement, salt-land reclamation, heavier topdressing better stock-breeding programmes, rabbit control, adequate drainage, fodder conservation, &c., necessary to achieve this.

Garden Notes for February

By GEORGE HYAM, Horticultural Supervisor

THE FLOWER GARDEN

PROPAGATING CONIFERS FOR SHADE OR ORNAMENT

IN southern districts, cypress or pines are still the most popular breakwind or shelter trees, and where quantity is desired, it is worth while to try and propagate such species on the property.

While the percentage of strike may be lower than that obtained by the nurserymen, the saving in cost can be considerable. Freight alone is a distinct item in present times if the trees have to be purchased from any but a local nursery. While conifers are not the easiest subjects to propagate from cuttings, the species are not difficult to raise from seed, and in districts where conifers are normally planted in quantity, cuttings of varieties can be rooted without much difficulty provided that they are taken and put down at the most favorable time, which is from the end of February until April.

Raising Species from Seed

Of the species most used for breakwind and shelter belts, the following can be best raised from seed :—*Cupressus macrocarpa ; C. Lawsonia ; C. Arizonica ; C. sempervirens fastigata ; Pinus radiata ; Sequoia gigantea* (Wellingtonia), and *sempervirens* (Redwood). Hill districts sometimes plant *Abies*, *Larix* or *Piceas* (Spruce), and species of these too can be raised from seed.

The best time for sowing such seed is in early spring from the beginning of August. In general, it is quite satisfactory to sow in the open ground in some well-drained and not too exposed position but the most economical way is to sow in boxes during the winter, under some cover, and transplant into a nursery bed when about 3 inches high. The soil under either system should be light and friable with a good humus content. Direct sowing should be done in drills about 8 inches apart and preferably on raised beds not more than 4 feet wide. The drills should be about 3 inches wide and about 1 inch deep, and the seed is sown broadcast as thinly as possible over the flat bottom of these.

A good plan is to provide a little temporary shade for the delicate germinating shoots with sprigs of bracken or brushwood along the row until the plants are a few inches high. At this stage too, they should be thinned out to about 3 inches apart and if care is taken, most of the thinnings will grow on after being transplanted. Alternatively, they can be potted up into individual containers to grow on to planting size. Seed of most of the popular species of conifers is obtainable from the leading seed firms.

Conifer Varieties must be Raised from Cuttings

Most of the ornamental conifers are varieties which have been selected from "sports" formed by the original species and, therefore, cannot be relied upon to come true to type from seed. This includes the popular *Cupressus Lambertiana* which loses its horizontal habit as a seedling ; the Pencil cypress, *C. sempervirens stricta* and all the variegated foliage varieties of conifers. All these and other varieties will come true if raised from cuttings.

Cutting wood should be of the current season's growth which is firm at the base but otherwise not overmature and woody. The length varies a little according to species and variety, but in general will be from 2 to 4 inches long. Cuttings are best pulled off with a downward jerk so as to leave a little heel of older wood at the base, and this is neatly trimmed off to a thin sliver. The ideal striking medium is a mixture of two parts of loam ; one part of leaf mould or peat and one part of sand, but a good friable, natural loamy soil will do, provided that the bottom of the cutting row is dressed with an inch or so of pure sand. The cuttings are inserted in rows about 4 inches apart after stripping off any foliage on the portion which is to be placed below the surface. The soil should be pressed firmly around each cutting.

Conifer cuttings are somewhat slow in callusing and active rooting will probably not take place until the following spring, but on the other hand, they are less likely to rot than cuttings of flowering trees or shrubs. However, as for other cuttings the main point is to preserve an even balance between too much and too little moisture, and to avoid the cuttings drying out too quickly, therefore, some form of overhead shade is desirable, such as a light screen of brushwood on frame supports fixed about 18 inches above the rows. To avoid excess moisture, make sure that the drainage is good. The sand layer along the cutting rows will also help considerably.

The next procedure is to transfer the rooted plants to nursery rows in the open, in the following autumn, about 12 inches apart and allow them to grow on to a fair size before lifting and planting out permanently. In order to get a good root system the nursery row plants should be wrenched in the autumn following transplanting.

Wrenching Helps Transplanting

The simple operation known as wrenching is advisable for any species of tree or shrub raised in open ground for direct transplanting without being previously lifted and established in some form of pot or other container. It could be said to be essential in the case of any evergreen shrub or tree which is to be lifted, balled, and replanted elsewhere.

In the case of conifers and other plants growing in a nursery row, a sharp spade is inserted vertically to its full depth midway between the plants in row; then on either side of the plant, drawing the spade towards the operator before withdrawing it. This causes the plant to lift a little, but with a ball of earth adhering to its unsevered roots. The plants are then tramped back into the original position. The effect of this wrenching is to sever some of the long roots and yet leave plenty attached to the plant. When this work is done in the autumn, a mass of new fibrous roots will be formed within the cuts by the proper time for lifting and planting out permanently in spring. By this time too, the plant will lift easily with an intact ball of earth around its roots and this of course greatly minimizes the shock of transplanting, and re-establishment will take place more quickly and readily.

Actually, the same principle can be applied to advantage to small plants such as boxed seedlings by running a sharp knife round each individual plant in the form of a square, some weeks before planting-out time. Such a method is particularly good for seedlings and small plants which are to be planted out in hot weather.

WRENCHING

[After Sheat]

(1) First cut. (2) Second cut on opposite side. (3) Spade on left wrenched sharply back after severing all roots. (4) Plant tramped back into position as operators move to next plant.

Planting Out the Winter Leaf Vegetables

As winter cabbages, cauliflowers, Brussels sprouts, and broccoli have to be planted out when the weather is hot and sometimes dry, there are certain points to be observed in order to avoid loss.

The ideal seedling is one which is about 6 inches high with a firm straight stem and stiff leaves, indicating that they have been properly hardened-off to meet severe conditions. As so many seedlings offered in shops are sold out of shallow boxes and are rather small, these require some extra care, though in summer boxed seedlings are to be preferred to bundled seedlings which may have been lifted for some time. As stressed in these notes before, it is always best to raise the few plants needed for the home garden on the spot so that they can be planted out at the most favorable stage and without possible deterioration through being out of the ground too long.

The home gardener will find he will get a better strike if he makes planting holes with a trowel rather than a dibber the day before planting and filling these with water so that the surrounding soil is in a state of mud at the time of planting. A seedling which has a good ball of earth round its roots (see afore-mentioned note on wrenching) will re-root with less difficulty as it will have more fibrous roots. It is not hard to preserve this ball if the plants are lifted from a seedling bed in the garden with a hand fork, but see that the bed has been watered the day before. Always inspect the growing point of the seedlings. If this is damaged in any way at this stage, it is very unlikely that a good heart will be formed, if at all.

A good deal of loss is caused by pockets of air being formed at the bottom of dibber holes. If dibbers are used, the commercial grower obviates this by compacting the soil round the plant with another sideways thrust of the dibber, but this requires a knack, and the home gardener, therefore, will find it best to plant his few plants with a trowel and plant as for any other species by pressing down the soil with the hands.

The question of whether the seedlings should be trimmed back or not is always a matter of some difference of opinion. The general idea of trimming back the outer leaves is to retard the loss of moisture of newly-planted seedlings by diffusion through a larger leaf area. This probably has advantages when, as in some commercial areas, winter leaf crops are planted without the aid of irrigation. However, in the average home garden where watering is possible, untrimmed leaves are probably the best. In this connection, it might be mentioned that experiments have shown that cuttings which have not been trimmed back in a similar way, and where moisture is adequate, root better and quicker on account of the foliage being able to perform its normal functions and this probably applies to planted-out seedlings of all kinds if the soil moisture is adequate.

It is also a practice amongst commercial growers to trim any long tap-root to induce bushy roots, but where seedlings have been given reasonable spacing in the seed beds, there are usually plenty of fibrous roots, particularly if they have been previously wrenched. Scanty fibrous and long tap roots are the result of overcrowding in the seed bed.

The final precaution is to use a weak nutrient solution to water in the plants.

This can be either very dilute liquid manure or a solution made up at the rate of ½ oz. of sulphate of ammonia and 1 oz. of superphosphate to the gallon of water. Except in the very hottest areas, shading is not desirable but where necessary, is best provided by pieces of brushwood or bits of board inserted at the northern side of each plant so that it protects from hot wind and perhaps early afternoon sun. Too heavy shading is apt to make the plants soft and flaccid, and too frequent watering will have the same effect, thus making them more liable to damage by heat when they become larger.

It may be as well to remind intending planters that the seedlings should be inserted with the lowest leaves just above ground level so that when the hearts are formed, their basal leaves almost rest on the surface without danger of the plant being blown over.

Some Points about Radishes

Radishes are about the easiest of all vegetables to grow but there is a big difference in flavour, and certainly in regard to their

(continued on page 48.)

FERTILIZERS FOR 1953

Registered Brands

By F. H. WILLIAMS, M.Sc., Deputy Chief Chemist

ALL fertilizers offered for sale in Victoria in lots of 56 lb. or over, must be registered with the Department of Agriculture, and lists of registered brands are issued annually. The 1953 list, published in the *Victoria Government Gazette* in December last, is reproduced in this issue. It sets out the brands, compositions, prices per ton, and where the fertilizers may be obtained. The table of unit values for 1953 appears at the head.

Requirements of the Fertilizers Act

As well as the need for registration, certain other requirements are necessary when the material is sold. A label must be attached to each bag, and this must show the guaranteed analysis figures and the weight; these details must also be stated in the invoice certificate.

During the year a Departmental officer inspects stocks of fertilizers held by merchants, and also investigates any complaints by farmers and others regarding fertilizers sold or offered for sale to them. Samples are taken for analysis in the Departmental laboratory and, should the results be unsatisfactory, proceedings may be taken against the responsible firm. Cases of the sale of unregistered fertilizers are also investigated. Most farmers are familiar with the main provisions of the Act, and know better than to buy unregistered brands; nevertheless, cases of the sale of such fertilizers occur at intervals. When a farmer buys a registered fertilizer, he buys a guaranteed product; but in buying an unregistered one, he often obtains an inferior or even a worthless one.

The Act is designed primarily to protect the farmer, who normally uses fertilizers in relatively large amounts. The provisions of the Act do not apply to fertilizers which are sold in small packets in stores, and used mainly by home-gardeners. In some cases, the names of these fertilizers indicate that the packets are simply filled from bulk lots of registered fertilizers and therefore the materials are of good quality, although the prices will be proportionately higher than when the larger bags are purchased. In other cases, there is no indication on the the packet of the composition or quality of the contents.

It should be remembered that, during the year, a small number of supplementary registrations will almost certainly be made; these will, of course, not show on the main list. Information concerning such brands may be obtained on inquiry.

Brands

This year's list of fertilizers is very similar to last year's. A new trace-element mixture (superphosphate with copper and zinc) appears. Several brands of dried blood and of bonedust have disappeared from the list.

Trace Element Mixtures

There are now quite a number of mixtures of superphosphate with trace-element compounds available for purchase. The use of such mixtures constitutes one of the simplest methods of adding trace elements to the soil. However, these mixtures are expensive, and again, should not be added unless necessary; Departmental advice should be obtained before using them.

Prices

Prices are based largely on costs of production, and are controlled by the Prices Branch. Most of the prices have risen since the publication of the 1952 list but, in general, the rises are fairly small, and not as great as those shown when the above list was published. In a few cases, prices have actually fallen.

Unit Values

The unit value of any particular ingredient (nitrogen, phosphoric acid, or potash) is the average commercial value of each 1 per cent. of that ingredient per ton of fertilizer. It is calculated from the selling prices and, as these prices have risen by only a relatively small amount, the new values are not very different from those of last year.

The value per ton of a fertilizer can be obtained by multiplying the percentage of each ingredient by its own unit value, and adding the results together. With a mixed fertilizer, about £2 or so should also be added to allow for the cost of mixing. Values so calculated are helpful in comparing different fertilizers or assessing new ones.

Demand for Fertilizers

Demand, of course, remains high, but it is interesting to note that buyers are now becoming a little more critical, and not so ready to take anything in the way of a fertilizer which happens to be offering. Price and analysis are now being considered. This follows the trend which is showing with purchasers of other commodities, and is an encouraging sign.

Inquiries and Advice

The Department is always ready to answer inquiries regarding fertilizers and their uses. Questions concerning matters dealt with under the Act, such as registration, composition, and so on, together with general recommendations for use of fertilizers, should be addressed to Chief Chemist, State Laboratories, Gisborne-street, Melbourne, C.2.

ANALYSES AND UNIT VALUES

Fertilizers Act 1928 (No. 3680).

UNIT VALUES FOR THE YEAR 1953.

	£	s.	d.
Nitrogen, organic, as Blood; Blood and Bone; Blood, Bone, and Flesh; and Bone ..	2	5	6
„ as Nitrate	2	19	10
„ as Ammonia	1	16	2
Phosphoric Acid—			
as Water Soluble in Superphosphate and Mixed and Complete Fertilizers containing Superphosphate	0	13	9
as Citrate Soluble	0	9	6
as Citrate Insoluble—			
in Superphosphate and Mixed and Complete Fertilizers containing superphosphate, except mixtures of superphosphate and bone or blood and bone	0	3	6
in other Fertilizers	0	8	6
Potash—			
as Sulphate	0	17	11
as Chloride	0	15	6

W. R. JEWELL, M.Sc., F.R.I.C.,
Chief Chemist.

Melbourne, 27th November, 1952.

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1953.

Description of Fertilizer.	Brand.	Nitrogen.					Phosphoric Acid.				Potash as Unspecified.	Price asked per ton.*	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone (and Flesh).	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
Nitrogenous—Readily Available.		%	%	%	%	%	%	%	%	%	%	£ s. d.	
Nitrate of Soda	Sickle in diamond	16·00	..	..	..	16·00	..	..	..	..	..	47 17 6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „	Pivot ..	16·00	..	..	..	16·00	..	..	..	..	..	47 17 6	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
Sulphate of Ammonia	Pivot ..	..	20·60	..	..	20·60	..	..	..	..	..	37 5 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne

* F.o.r. at Melbourne or Railway Station nearest place of manufacture.

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1953—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.					Phosphoric Acid.				Potash as Muriate.	Price asked per ton.*	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
Nitrogenous—Readily Available—continued.		%	%	%	%	%	%	%	%	%	%	£ s. d.	
Sulphate of Amonia	Sickle in diamond	..	20·60	..	..	20·60	..	..	..	..	..	37 5 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „	Icianz ..	..	20·60	..	..	20·60	..	..	..	..	..	37 5 0	Imperial Chemical Industries of Aust. and N.Z. Ltd., 380 Collins-st., Melbourne
„ „	Cresco ..	..	20·60	..	..	20·60	..	..	..	..	..	37 5 0	Cresco Fertilizers Ltd., Geelong
Ammonium Nitrate with Lime	N.A.C. ..	10·3	10·2	..	..	20·5	..	..	..	..	..	34 5 0	Imperial Chemical Industries of Aust. and N.Z. Ltd., 380 Collins-st., Melbourne
Moderately Available.													
Dried Blood ..	M..C.C in diamond	..	..	12·00	..	12·00	..	..	..	..	..	28 9 0	Melbourne City Council, Town Hall, Melbourne
„ „	Champion ..	..	..	13·00	..	13·00	..	..	..	..	..	28 0 0	Sims Cooper (Freezing Works) Pty. Ltd., 31 Queen-st,. Melbourne
Blood Manure ..	Dandy ..	..	..	10·56	..	10·56	..	..	..	..	..	24 10 0	Gippsland Co-op. Bacon Curing Co. Ltd., Dandenong
Slowly Available.													
Castor Meal ..	Alba ..	..	..	..	..	4·50 (as castor meal)	..	..	2·25	2·25	0·75	10 5 0	Lycett Proprietary Ltd., 202 Normanby-rd., Montague
Phosphatic—Readily Available.													
Super-phosphate—22 per cent...	Sickle in diamond	..	..	..	..	..	20·50	0·50	1·00	22·00	..	14 10 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „	Pivot ..	..	..	..	..	..	20·50	0·50	1·00	22·00	..	14 10 0	Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
„ „ ..	Cresco ..	..	..	..	..	..	20·50	0·50	1·00	22·00	..	14 10 0	Cresco Fertilizers Ltd., Geelong
Superphosphate plus Trace Elements.													
Super. with Zinc‡	Sickle in diamond	..	..	..	..	..	19·00	0·50	0·90	20·40	..	16 17 9	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „ †	Cresco ..	..	..	..	..	..	19·70	0·50	1·00	21·20	..	16 17 9	Cresco Fertilizers Ltd., Geelong
„ „ ‡	Pivot ..	..	..	..	..	..	19·00	0·50	0·90	20·40	..	16 17 9	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
Super. with Copper§	Sickle in diamond	..	..	..	..	..	19·70	0·50	1·00	21·20	..	20 5 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „	Cresco ..	..	..	..	..	..	19·70	0·50	1·00	21·20	..	20 5 0	Cresco Fertilizers Ltd., Geelong
„ „	Pivot ..	..	..	..	..	..	19·70	0·50	1·00	21·20	..	20 5 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
Super. with Copper and Zinc°	Sickle in diamond	..	..	..	..	..	19·00	0·50	0·90	20·40	..	21 7 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
Super. with Copper and Cobalt‖	Cresco ..	..	..	..	..	..	19·70	0·50	1·00	21·20	..	23 6 0	Cresco Fertilizers Ltd., Geelong
„ „	Sickle in diamond	..	..	..	..	..	19·70	0·50	1·00	21·20	..	23 6 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
Super. with Molybdenum¶	Sickle in diamond	..	..	..	..	..	20·50	0·50	1·00	22·00	..	16 18 9	„ „ „

* F.o.r. at Melbourne or Railway Station nearest place of manufacture.——† Contains 7 lb. zinc sulphate (anhydrous) per 187-lb. bag.——‡ Contains 14 lb. zinc sulphate (hydrated) per 187-lb. bag.——§ Contains 7 lb. copper sulphate (hydrated) per 187-lb. bag.——‖ Contains 7 lb. copper sulphate and 6 oz. cobalt sulphate/chloride per 187-lb. bag.——¶ Contains 2 oz. molybdenum oxide and/or sodium molybdate per 187-lb. bag.——° Contains 7 lb. copper sulphate (hydrated) and 7 lb. zinc sulphate (hydrated) per 187-lb. bag.

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1953—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.					Phosphoric Acid.				Potash as Unspecified	Price asked per ton.*			Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone (and Flesh).	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.		£	s.	d.	
		%	%	%	%	%	%	%	%	%	%				
Phosphate—Moderately Available.															
Basic Super. (reverted)	Sickle in diamond	..	..	..	..	..	..	15·50	3·20	18·70	..	16	3	3	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	Pivot ..	..	..	..	..	..	..	15·50	3·00	18·50	..	16	3	3	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
Super. and Lime (1 and 1)	Sickle in diamond	..	..	..	..	..	2·00	8·00	1·00	11·00	..	12	16	9	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	Cresco ..	..	..	..	..	..	2·00	8·00	1·00	11·00	..	12	16	9	Cresco Fertilizers Ltd., Geelong
" "	Pivot ..	..	..	..	..	..	2·00	8·00	1·00	11·00	..	12	16	9	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
Slowly Available.															
Ground Phosphate—80 per cent.	Sickle in diamond	..	..	..	..	..	..	..	36·65	36·65	..	13	7	9	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	Pivot ..	..	..	..	..	..	..	..	36·50	36·50	..	13	7	9	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
Potassic—Readily Available.															
Muriate of Potash	Sickle in diamond	..	..	..	..	..	..	..	..	..	58·00 (as chloride)	41	15	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	Pivot ..	..	..	..	..	..	..	..	..	..	50·00 (as chloride)	41	15	0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
Sulphate of Potash	Sickle in diamond	..	..	..	..	..	..	..	..	..	48·00 (as sulphate)	43	2	6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
" "	Pivot ..	..	..	..	..	..	..	..	..	..	48·00 (as sulphate)	43	2	6	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
MIXED FERTILIZERS.															
Containing Nitrogen and Phosphoric Acid—Readily Available.															
Super. and Ammonia	Cresco (1 and 1)	..	10·30	..	..	10·30	10·25	0·25	0·50	11·00	..	28	13	6	Cresco Fertilizers Ltd., Geelong
" "	Cresco (3 and 1)	..	5·00	..	..	5·00	15·40	0·30	0·80	16·50	..	22	4	9	" " "
" "	Cresco (6 and 1)	..	2·90	..	..	2·90	17·50	0·40	0·90	18·80	..	19	12	3	" " "
" "	Cresco (2 and 1)	..	6·87	..	..	6·87	13·66	0·34	0·66	14·66	..	24	5	0	" " "
" "	Pivot II. (3 and 1)	..	5·00	..	..	5·00	15·30	0·30	0·80	16·40	..	22	4	9	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
" "	Pivot I. (6 and 1)	..	2·90	..	..	2·90	17·50	0·40	0·90	18·80	..	19	12	3	" " "
" "	Pivot II. (*a*) (2 and 1)	..	6·80	..	..	6·80	13·60	0·30	0·70	14·60	..	24	5	0	" " "
" "	Pivot III. (1 and 1)	..	10·30	..	..	10·30	10·20	0·20	0·50	10·90	..	28	13	6	" " "

* F.o.r. at Melbourne or Railway Station nearest place of manufacture.

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1953—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.					Phosphoric Acid.				Potash as Unspecified.	Price asked per ton.*	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone (and Flesh.)	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	%	£ s. d.	
MIXED FERTILIZERS—*continued.*													
Containing Nitrogen and Phosphoric Acid—Readily Available.													
Super. and Ammonia	Sickle in diamond (3 and 1)	..	5·00	..	..	5·00	15·40	0·40	0·70	16·50	..	22 4 9	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „	Sickle in diamond (6 and 1)	..	2·90	..	..	2·90	17·60	0·40	0·90	18·90	..	19 12 3	„ „ „
„ „	Sickle in diamond (2 and 1)	..	6·90	..	..	6·90	13·70	0·30	0·70	14·70	..	24 5 0	„ „ „
„ „	Sickle in diamond (1 and 1)	..	10·30	..	..	10·30	10·25	0·25	0·50	11·00	..	28 13 6	„ „ „
Nitro Superphosphate	Sickle in diamond	..	1·50	..	0·50	2·00	17·60	0·90	1·30	19·80	..	19 9 9	„ „ „
„ „	Cresco ..	..	1·50	..	0·50	2·00	17·60	0·70	1·50	19·80	..	19 9 9	Cresco Fertilizers Ltd., Geelong
Bone, Offal, Rock Phosphate, and Sulphate of Ammonia	Wooltana No. 1.	..	2·00	..	2·00	4·00	..	1·00	8·15	9·15	..	20 10 0	L. G. Thorne and Co. Pty. Ltd., 317 Collins-st., Melbourne
Flesh, Hoof, Blood, Bone, and Treated Leather	Pannifex No. 1	..	..	..	5·75 (partly as treated leather)	5·75	..	3·00	3·75	6·75	..	15 0 0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Containing Phosphoric Acid and Potash—Readily Available.													
Super, and Potash	Sickle in diamond	..	..	..	..	..	15·40	0·40	0·70	16·50	11·20	21 6 6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
„ „	Pivot IX (3 and 1)	..	..	..	..	..	15·40	0·30	0·80	16·50	11·20	21 6 6	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
„ „	Cresco (3 and 1)	..	..	..	..	..	15·40	0·30	0·80	16·50	11·25	21 6 6	Cresco Fertilizers Ltd., Geelong
ANIMAL FERTILIZERS.													
Containing Nitrogen and Phosphoric Acid—Moderately Available.													
Blood and Bone	Dundas ..	..	..	..	..	4·50	4·50	..	8·00	10·00	18·00	..	18 12 0	J. A. Dundas Pty. Ltd., 67 Burnley-st., Richmond
„ „	Murray ..	..	..	..	..	5·28	5·28	..	5·83	7·50	13·33	..	17 17 0	Western and Murray Co-operative Bacon and Meat Packing Co. Ltd., 522 Flinders-lane, Melbourne
„ „	Pridham's ..	..	..	..	..	5·00	5·00	..	6·00	8·00	14·00	..	17 18 0	W. Pridham Pty. Ltd., Evans-st., Braybrook
„ „	Kitchen's ..	..	..	..	..	6·80	6·80	..	9·00	5·00	14·00	..	22 12 0	J. Kitchen and Sons Pty. Ltd., Ingles-st., Port Melbourne

* F.o.r. at Melbourne or Railway Station nearest place of manufacture.

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1953—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.					Phosphoric Acid.				Potash as Unspecified.	Price asked per ton.*			Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone (and Flesh).	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.		£	s.	d.	
ANIMAL FERTILIZERS—*continued.*		%	%	%	%	%	%	%	%	%	%				
Containing Nitrogen and Phosphoric Acid—Moderately Available—continued.															
Blood and Bone	Champion ..	..	..	..	7·00	7·00	..	3·50	4·50	8·00	..	19	14	0	Sims Cooper (Freezing Works) Pty. Ltd., 31 Queen-st., Melbourne
,, ,,	Fitzgerald's ..	..	..	..	5·00	5·00	..	7·00	10·00	17·00	..	18	16	0	P. Fitzgerald and Sons Pty. Ltd., Warrigal-rd., Oakleigh
,, ,,	T.B. and S. in diamond (Portland)	..	..	..	6·00	6·00	..	7·00	5·00	12·00	..	19	6	0	Thos. Borthwick and Sons (A'asia) Ltd., 84 William-st., Melbourne
,, ,,	T.B. and S. in diamond (Brooklyn) No. 1	..	..	..	6·00	6·00	..	7·00	5·00	12·00	..	19	18	6	,, ,, ,,
,, ,,	T.B. and S. in diamond (Brooklyn) No. 2	..	..	..	4·50	4·50	..	7·00	11·00	18·00	..	19	4	6	,, ,, ,,
,, ,,	Apex ..	..	..	..	4·50	4·50	..	7·00	9·00	16·00	..	17	5	3	North-Eastern Bone Products, Wangaratta
,, ,,	Arch ..	..	..	..	5·50	5·50	..	9·00	7·00	16·00	..	20	0	0	Victorian Inland Meat Authority, 54 Market-st., Melbourne
,, ,,	Pentagon ..	..	..	..	5·61	5·61	..	8·64	8·25	16·89	..	20	13	0	Mulgrave By-Products Co., North-rd., East Oakleigh
,, ,,	Sayer ..	..	..	..	4·25	4·25	..	8·85	9·90	18·75	..	18	9	0	Sayer and Co. Inc., Laverton
,, ,,	A and A Surprise	..	..	..	5·00	5·00	..	4·00	10·00	14·00	..	17	17	0	G. W. Pennell (dec'd), Burke-st., Braybrook
,, ,,	A and A Surprise No. 2	..	..	..	7·75	7·75	..	3·20	5·80	9·00	..	21	17	0	,, ,, ,,
,, ,,	Echuca ..	..	..	..	4·75	4·75	..	7·00	8·00	15·00	..	16	0	8	Dench Smallgoods Pty. Ltd., Echuca
,, ,,	Vima ..	..	..	..	5·00	5·00	..	10·00	12·00	22·00	..	21	5	0	Victorian Inland Meat Authority, 54 Market-st., Melbourne
COMPLETE FERTILIZERS.															
Containing Nitrogen, Phosphoric Acid and Potash—															
Readily Available.															
Complete Fertilizer	Sickle in diamond (Market Garden) No. 2	..	3·10	..	0·75	3·85	14·30	1·00	1·40	16·70	2·20	23	8	6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Sickle in diamond (A) (5.1.1)	..	2·90	..	..	2·90	14·60	0·40	0·70	15·70	6·40 (as chloride)	23	6	9	,, ,, ,,
,, ,,	Sickle in diamond No. 1 (5.1.1) (Potatoes)	..	2·90	..	..	2·90	14·60	0·40	0·70	15·70	6·80 (as sulphate)	24	14	0	,, ,, ,,
,, ,,	Sickle in diamond (B) (5.2.1)	..	5·00	..	..	5·00	12·80	0·30	0·60	13·70	5·60 (as chloride)	25	10	9	,, ,, ,,

* F.o.r. at Melbourne or Railway Station nearest place of manufacture.

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1953—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.					Phosphoric Acid.				Potash as Unspecified.	Price asked per ton.*	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone (and Flesh).	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
COMPLETE FERTILIZERS—*continued.*		%	%	%	%	%	%	%	%	%	%	£ s. d.	
Containing Nitrogen, Phosphoric Acid and Potash—Readily Available—continued.													
Complete Fertilizer	Sickle in diamond No. 2 (5.2.1) (Potatoes)	..	5·00	..	..	5·00	12·80	0·30	0·60	13·70	6·00 (as sulphate)	26 15 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st, Melbourne.
„ „	Sickle in diamond (C) (4.4.1)	..	9·15	..	..	9·15	9·10	0·20	0·40	9·70	5·00	30 2 0	„ „ „
„ „	Sickle in diamond (D) (2.2.1)	..	8·20	..	..	8·20	8·20	0·20	0·40	8·80	9·00	31 1 9	„ „ „
„ „	Pivot IV. (5.1.1)	..	2·90	..	..	2·90	14·60	0·30	0·80	15·70	6·40	23 6 9	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
„ „	Pivot V. (A) (5.2.1)	..	5·00	..	..	5·00	12·80	0·30	0·60	13·70	5·60	25 10 9	„ „ „
„ „	Pivot V. (2.2.1)	..	8·20	..	..	8·20	8·20	0·20	0·40	8·80	9·00	31 1 9	„ „ „
„ „	Pivot VI. (4.4.1)	..	9·10	..	..	9·10	9·10	0·20	0·40	9·70	5·00	30 2 0	„ „ „
„ „	Cresco No. 1 (5.1.1)	..	2·90	..	..	2·90	14·64	0·36	0·70	15·70	6·43	23 6 9	Cresco Fertilizers Ltd., Geelong
„ „	Cresco No. 2 (4.4.1)	..	9·15	..	..	9·15	9·11	0·22	0·44	9·77	5·00	30 2 0	„ „ „
„ „	Cresco No. 3 (5.2.1)	..	5·00	..	..	5·00	12·80	0·30	0·62	13·72	5·62	25 10 9	„ „ „
„ „	Cresco No. 4 (2.2.1)	..	8·24	..	..	8·24	8·20	0·20	0·40	8·80	9·00	31 1 9	„ „ „
„ „	Cresco (Market Garden Manure)	..	3·10	..	0·75	3·85	14·30	0·80	1·60	16·70	2·20	23 8 6	„ „ „
„ „	Hortico (Rapid Grower)	..	2·00	1·00 (as organic)	..	3·00	8·00	1·00	3·00	12·00	2·00 (as sulphate)	22 2 6	Horticultural Industries Pty. Ltd., 67 Burnley-st., Richmond
„ „	Hortico No. 1	..	..	..	4·00	4·00	..	7·00	9·00	16·00	3·00 (as sulphate)	20 19 3	„ „ „
„ „	Hortico No. 2	..	1·50	..	1·50	3·00	10·00	3·00	5·00	18·00	2·00 as) sulphate)	21 5 0	„ „ „
„ „	Hortico No. 3	..	5·50	..	1·50	7·00	5·00	3·00	4·00	12·00	6·00 (as sulphate)	27 0 0	„ „ „

Description of Fertilizer.	Brand.	Nitrogen as Bone.	Phosphoric Acid.	Mechanical Condition.		Price asked per ton.*	Where Obtainable.
				Fine Bone.	Coarse Bone.		
		%	%	%	%	£ s. d.	
Bonedust ..	Apex ..	3·25	20·00	50·0	50·0	9 10 0	North-Eastern Bone Products, Wangaratta
„ ..	Mount Clear..	3·00	19·00	50·0	50·0	8 0 0	J. C. Foord and Co., 116 Eureka-street, Ballarat
„ ..	Hearmei ..	3·93	24·27	53·0	47·0	10 0 0	J. Vernon, Vinifera
„ ..	Prospex ..	2·40	26·80	72·5	27·5	12 10 0	G. McL. Holt, Marong-road, Malden Gully, Bendigo

* F.o.r. at Melbourne or Railway Station nearest place of manufacture.

Melbourne, 27th November, 1952.

W. R. JEWELL, M.Sc., F.R.I.C.,
Chief Chemist.

LICENSED SKIN BUYERS

Sheep Owners' Protection Act

List of persons licensed under the Sheep Owners' Protection Act to buy raw sheep skins. The licences are effective to the 31st December, 1952.

Licence No.	Holder of Licence.	Business Address.
3271	Ainslie, J. D. ..	Ray-street, Castlemaine
3272	Alexander, H. H. ..	Kirkland-avenue, Euroa
3094	W. Angliss and Co. (Aust.) Pty. Ltd.	Imperial Freezing Works, Lynch-street, Footscray
3426	Austin and Ford Pty. Ltd.	Austin-street, Hopetoun
3274	Baker, C. J. ..	Wood-street, Donald
3275	Banks, C. L. ..	Barkley-street, Ararat
3430	Baud and Co. ..	Showgrounds, Ascot Vale
3276	Bennett, H. H. ..	411 King-street, City
3433	Bennett, R. L. ..	South-road, Warragul
3277	Bennett, S. C., and Son	71 Isabella-street, Geelong West
3278	Berman, D. ..	395 St. Kilda-street, Elwood
3279	Biggs, A. E. ..	Bair-street, Leongatha
3280	Biggs, H. A., and Son	Korumburra
3281	Black, S. B. P. ..	2 Bradshaw-street, Ballarat
3282	Borthwick, T., and Sons (A'sia.), Ltd.	84 William-street, Melbourne
3283	Braybrook Skins and Hides Pty. Ltd.	Sommerville-road, Brooklyn
3284	Brooks, E. J. ..	Guthrie-street, Quambatook
3416	Byerley, H. M. ..	115 Wright-street, Adelaide, S.A.
3285	Bryant, A. J. W. ..	Hanson-street, Corryong
3286	Bryant, S. M. ..	Walwa, via Wodonga
3287	Bunn, W. G. ..	Warragul
3288	Burns and McLeave..	206 Mair-street, Ballarat
3289	Burrows, G. A. ..	27 Scoresby-street, Kerang
3290	Butler, E., and Sons	Tallangatta
3291	Bye, H. J. ..	163 Baillie-street, West, Horsham
3424	Calder, Richard Wm.	Korumburra
3292	Cary, William Arthur	High-street, Heathcote
3293	Callan, P. J., and Sons	6-8 Moorabool-street, Geelong
3294	Canfield, E. F. ..	Gillies-street, Rochester
3295	Carlile Bros. ..	Strickland-road, Bendigo
3296	Claffey, A. S. ..	Federal-street, Rainbow
3297	Cole, Archibald ..	Hexham-road, Mortlake
3298	Cole, M., and Sons ..	Camperdown-road, Terang
3299	Cook, T. J. ..	Black-street, Terang
3300	Cooper, Arthur S., Pty. Ltd.	87 Lambeth-street, Kensington, W.1.
3301	Coulstock, Kenneth ..	65 Welsford-street, Shepparton
3434	Croome, Norman J. ..	15 Glenview-road, Strathmore
3302	Davis, Lindsay D. ..	Edward-street, Fawkner, N.15
3303	Dewez, T., and Co. Pty. Ltd.	Footscray-road, Footscray
3304	Diviny, Bartholomew	King George-street, Cohuna
3305	Duggan, Thomas A. ..	Mollison-street, Kyneton
3306	Dwyer, John P. ..	23A Mantell-street, Moonee Ponds
3429	Eales, F.	Bell-street, Penshurst
3307	Easton, Miscamble and Co.	533 Collins-street, City
3308	Egon, Francis H. ..	High-street North, Avoca
3309	Einsiedel, E. B. ..	New Zealand Loan and Mercantile Co., South Kensington
3310	Elias, E. R. ..	389 David-street, Albury, N.S.W.
3311	Ellis, John M. ..	39 Roberts-street, Essendon
3312	Evans, C. J., and Sons	83 French-street, Hamilton
3313	Evans, W. J. ..	Victoria-street, Boort
3314	Ferguson, F. McH. ..	80 McIvor-road, Bendigo
3315	Ferris, R. J. ..	Port Fairy-road, Warrnambool
3316	Flanigan, J. ..	Murray-street, Colac
3317	Francis, S. F. ..	Winchelsea
3318	Gordon, C. G. ..	313 King-street, Melbourne
3319	Grant, C. L. ..	Heywood
3321	Grey, J. G. ..	High-street, Mansfield
3322	Hardy, F. A. ..	Myamyn
3323	Hardy, James H. ..	77 Campbell-street, Port Fairy
3324	Hargreaves Bros. Pty. Ltd.	Ararat and Willaura
3325	Hargreaves, S. E. ..	Terang-road, Mortlake
3326	Harris, L.	Wakeham-street, Stawell
3327	Harbey, R. C. ..	57 Gheringhap-street, Geelong
3328	Haughton, W., and Co. Ltd.	545 Little Collins-street, Melbourne
3417	Heddle, R. L. ..	4 Wellington-street, Kerang
3414	Hicks, John T. ..	Box 9, Goroke
3329	Hicks, Robert ..	Commercial-street, Kaniva
3330	Hill, Duncan and John D.	6 Phillip-street, Warracknabeal
3331	Hofbauer, Frank ..	35 McIlwraith-street, North Carlton
3332	Irwin, F. J. ..	39 Richmond-crescent, East Geelong
3333	Jackson, G. J. E. ..	Cr. Macaulay-road and Bent-street, Kensington
3334	Jackson, J. L. ..	Bairnsdale
3335	James, Dudley ..	199 Boundary-road, North Melbourne
3336	Jinkins, Peter Kevin	53 Collett-street, Kensington
3337	Jobe, C. E. ..	Lower Main-street, Stawell
3338	Johnson, A. P. ..	Station-street, Lake Boga
3431	Monaro Wool and Fur Co. Pty. Ltd.	Maybe-street, Bombala
3339	Kane, F. J. ..	185 King-street, Hamilton
3340	Kennon, J., and Sons Pty. Ltd.	River-street, Richmond
3341	Lindsay, D. H. ..	Railway Yard, Jeparit
3342	Lockie, C. J. ..	47 Wallace-crescent, Pascoe Vale South, W.7
3343	Lockwood and Sons, Pty. Ltd.	Cumming-avenue, Birchip
3344	Long, C. J. ..	12 Campbell-street, East Kew
3345	McArce, Marion G. ..	Cr. of High and Warren streets, Echuca
3346	McClintock, A. E. ..	Bowen-street, Digby
3425	McDonald, D. M. and Sons	Corrang-road, Beulah
3347	McGauchie, A. A. J. ..	5 Main-street, Cobram
3348	McGinty, L. S. ..	Murray-street, Casterton
3349	McGuire, Louis ..	Spencer-street, Albury
3419	McKenzie, C. N. ..	49A Shaftesbury-street, West Coburg
3350	McLaren, W. J. ..	24 Baynes-street, Terang
3351	McLennan, Donald ..	Webster-street, Wycheproof
3352	McLennan, Duncan J., and Son	Best-street, Sea Lake
3353	McMartin, F. W. ..	Dimboola
3354	McMillan, R. H. ..	41 Gibrey-street, Maffra
3355	McNicol, J. W. ..	Charlton-road, St. Arnaud
3356	McVitty, J. W. and E. L.	57 McMahon-street, St. Arnaud
3357	Marshall, G., and Donelly	Edenhope
3418	Maxwell, D. ..	c/o Smorgan Bros., Sommerville-road, Brooklyn
3358	Menzies, J. D. ..	26 Klama-road, Flemington
3359	Moore, D. R. ..	Hamilton-street, Kilmore
3360	Moynihan, J. P. ..	De Boos-street, Euroa
3361	Munday's Distributing Co.	46 Moorabool-street, Geelong
3362	Murphy, T. H. ..	High-street, Seymour
3363	New Zealand Trading Co. Pty. Ltd.	514 Flinders-street, Melbourne
3364	Niddrie, L. G. ..	27 Lonsdale-street, Hamilton
3365	The North-Western Wool and Skin Stores	Gummow-street, Swan Hill
3366	O'Beirne, D. J. ..	703 Windemere-street, Ballarat
3367	O'Beirne, F. J. ..	Skipton-road, Linton
3368	O'Beirne, J. D. ..	Hamilton-street, Horsham
3415	O'Bryan, T. G. ..	Wattle-street, Manangatang
3369	O'Donnell, J. A. ..	Renmark, S.A.
3370	Parker, S. K. ..	Hovell-street, Wodonga
3371	Penney, F. H. ..	3 Balaclava-street, Ballarat
3372	Penney, Howard ..	422 Ascot-street, Ballarat
3373	Permezel, Y. A. ..	High-street, Yackandandah
3374	Perry, A. J. ..	Princes-Highway, Colac West

LICENSED SKIN BUYERS—*continued.*

Licence No.	Holder of Licence.	Business Address.
3375	Pettit, W. B. ..	110A Napier-street, St. Arnaud
3376	Pickthall, J. W. ..	4 Silvermines-road, St. Arnaud
3377	Prevost and Co. (Pty.) Ltd.	555 Little Collins-street, Melbourne, C.1.
3378	Pyramid Co-op. Society Ltd.	Pyramid Hill, Vic.
3435	Quarrell, F. E. A. ..	Clark-street. Cobden
3379	Reason, C. T. ..	Pekin-road, Maryborough
3380	Rehfisch, H. K. ..	223 Mair-street, Ballarat
3381	Rice, J. P., and Taylor, L.	McDonald-street, Murtoa
3382	Rice, J. W. ..	315–317 Mair-street, Ballarat
3383	Rich, H. J. (trading as Rich and Gross)	Brougham-place, Geelong
3384	Richards, E. R. ..	1 North-Western-road, St. Arnaud
3385	Richards, J. J. ..	42 Crimea-street, Caulfield
3421	Ross, J.	14–16 Raglan-street, East Preston
3386	Ross and Brewster Pty. Ltd.	1 Little Curran-street, North Melbourne
3387	Russell, Ralph ..	Colac West
3388	Segrave, W. F. ..	Yaapeet
3389	Shanock, C. H. J. ..	Bessiebelle
3390	Short, I. W. ..	George-street, Hamilton
3391	Sims Cooper (Freezing Works), Pty. Ltd.	Corio, North Geelong, and Newport
3392	Small Bros. ..	424 Sturt-street, Ballarat
3393	Smorgon's Rabbit and Poultry Packing Co. Ltd.	Sommerville-road, Brooklyn
3394	Stanley, J. S. ..	Brougham-place, Geelong
3395	Stanton, J. ..	Nelson-street, Nhill
3396	Steel, J. A. ..	33 Hope-street, West Footscray
3422	Stokes, C. B. ..	Bendoc
3397	Taylor, H. G. ..	Cumming-avenue, Birchip
3398	Thomas, E. S. ..	16 Hill-street, Bendigo
3432	Thomas, J. C. ..	273 Wattle-street, Bendigo
3399	Thomas, Stanley Sydney	Cr. Wattle and Victoria streets, Bendigo
3400	Thompson, W. L. ..	Melbourne-road, Yea
3401	Threadgold, R. J. and L. H.	Mann-street, Pinnaroo, S.A.
3402	Victorian Inland Meat Authority	Ballarat, Bendigo, and Donald
3403	Vigar, J. L. ..	McDonald-street, Numurkah
3404	Vines, A. A. ..	Bromley-road, Robinvale
3405	Waters, S. H., and Co. Pty. Ltd.	Benalla, Wangaratta, Hamilton, Casterton, Coleraine, Horsham
3406	Watson, E. L. ..	Whyte-street, Coleraine
3407	Wheatland, W. ..	Brougham-place, Geelong
3408	Wheaton and Son ..	Miram
3428	Wheeler, R. H. ..	Hannon-street, Sea Lake
3436	White, A. W. ..	Birchip
3423	Wilcox Moffiin Ltd. ..	34 King-street, Melbourne
3409	Wingfield, E. H. ..	High-street, Charlton
3410	S. E. Wool and Skins Ltd.	Sturt-street, Mount Gambier, S.A.
3411	Woolfe, R. C. ..	7 Epsom-road, Kensington
3427	Wright, N. A. ..	140 Swallow-street, Shepparton
3412	Young's Blue Store Pty. Ltd.	Cumming-avenue, Birchip
3420	Young, V. H. ..	Orford
3413	Zed, A., and Sons Ltd.	Commercial-street, Mount Gambier, S.A.

THE VEGETABLE GARDEN—(*continued from page 39*)

digestibility, if they are grown well. Actually radishes can be sown and grown at any time but the period when each sowing is at its best is not long. A good table radish needs to be grown quickly and steadily and its texture and flavour is based on being used at the right stage and long before full maturity. It is also the better for being pulled just before use, and home-grown radishes will be superior to those sold in shops if these points are observed. For continuity, small fortnightly or three-weekly sowings should be made. Radishes are usable in 30 days from sowing in summer, and so the small quantity required at any one time can be sown between any recently planted or sown vegetable crop. Always sow in drills and not broadcast, and thin out to 1½ inches apart at the two-leaved stage.

There is little difference in the various kinds, but the round or oval varieties have the more delicate flavour and keep in a better condition for a rather longer period than the larger, long types. Of the latter, the red varieties are a little hotter in flavour than the white radishes.

In summer, radishes need plenty of moisture, otherwise they will develop a lot of fibre and all radishes should be used well before they develop a hollow centre.

It is not generally known that the young seed pods of radishes left to grow on to this stage or planted for the purpose, make an excellent pickle. They are first blanched in hot brine and, after cooling, spiced vinegar is poured on or they can be included in mixed pickles.

Another use for radishes is to sow them in the same drill as slow-growing seeds like carrot, parsnip or parsley. They germinate quickly and, therefore, indicate the line of the row for weeding purposes. They will not interfere with their companion crop as they can be used for the table at about the same time as the normal first thinning of the major crop is due.

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VICTORIA

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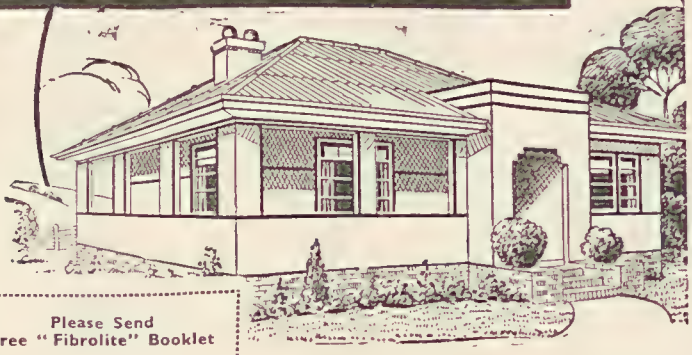

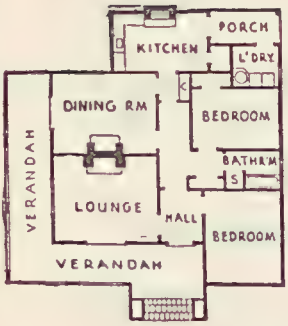

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Irrigated Lucerne in Victoria

By A. MORGAN, B.Agr.Sc., Senior Irrigation Officer

Previous instalments of this series of articles on irrigated lucerne in Victoria appeared in the February, August and October issues of this Journal

THIS instalment continues a discussion of methods tried in the past forty years to overcome the problem of poor penetration of irrigation water in soils of the red-brown earths group.

(*h*) Increased Frequency of Irrigation

One of the major virtues of lucerne, when grown on a soil showing a satisfactory infiltration rate, is that it does not require to be irrigated as often as a pasture of perennial species in order to maintain a satisfactory rate of growth.

On a soil exhibiting unsatisfactory infiltration, however, the period which can be allowed between irrigations without cessation of growth of the lucerne is not much longer than in the case of the perennial pasture. An inspection by the District Agricultural Officer, with a view to a decision as to whether the condition of poor infiltration may be expected to show improvement soon enough to justify retention of the lucerne, or whether the area might be put to better use under an annual pasture, is suggested in dubious cases.

(*i*) Preparatory Crops

The influence of a summer-irrigated annual crop (for example, Japanese millet), on the development of a lucerne stand sown subsequently, was investigated at two sites in the Murray Valley Irrigation District during 1949–51 in co-operation with local officers of the State Rivers and Water Supply Commission and the Soldier Settlement Commission.

The purpose of the experiment was to determine the effect, if any, of the summer waterings given to the Japanese millet in increasing the depth of penetration of irrigation water into the tight clay subsoil. Assessment of the effect was by soil probe readings and by analyses of the moisture content of the subsoil.

STACKING BALED FODDER.

Above : How to do it.

Right : How NOT to do it.

A good type of concrete outlet with steel-plate door.

The plots were on Moira loam (for description, see C.S.I.R.O. Bulletin 152) at the following sites :—

(*a*) South-central portion of Block 153 (Mr. C. Pascke).

(*b*) South-eastern portion of Block 91A (Mr. W. McLuckie).

Each plot consisted of eight half-chain bays 5 to 6 chains long.

The grading and sowing were done by officers of the Katunga Construction Branch of the State Rivers and Water Supply Commission and the Kerang Agricultural Centre.

At each site, four bays were sown to Japanese millet (with superphosphate) in early summer (1949), and four left in fallow, the arrangement being ABBAABAB, where A = fallow, B = millet.

The millet bays were irrigated as required and grazed by cattle. In autumn 1950, all bays were sown to lucerne, the bays previously sown to millet not being given any superphosphate, so that after the lucerne sowing, all bays had received one dressing of superphosphate at the rate of one bag per acre.

Mean results from sixteen soakage trials on the plots on 30th to 31st August, 1949, were :—

TABLE 10.—WATER ABSORPTION, MURRAY VALLEY IRRIGATION DISTRICT, MOIRA LOAM, 30TH TO 31ST AUGUST, 1949.

	Inches Absorbed in—						
Minutes	10	20	30	40	50	60	80
Mr. Pascke's plot ..	0·9	1·1	1·2	1·3	1·4	1 5	1·6
Mr. McLuckie's plot	1·7	1·9	2·0	2·1	2·2	2·2	..

The foregoing results show that the soil of these two sites was characterized by a rapid initial infiltration for a period of ten to twenty minutes, followed by slow infiltration.

Soil probe readings made one day after irrigation were as shown in Table 11.

TABLE 11.—SOIL PROBE READINGS, 1950–51, MOIRA LOAM SITES.

Pascke's Plot.			McLuckie's Plot.		
Date.	Lucerne (After Japanese Millet).	Lucerne.	Date.	Lucerne (After Japanese Millet).	Lucerne.
13.10.50	14	17	12.10.50	17	20
8.11.50	15½	14½	9.11.50	16½	24½
24.11.50	10	15	..	..	..
9.2.51	8	8	..	..	..
21.2.51	10	8	21.2.51	10	14
16.3.51	8	7	..	..	..
5.4.51	7	7	..	..	..

There is nothing in the results to indicate any effect of the prior irrigation of the millet on the penetration of water as measured by soil probe. However, establishment counts at Pascke's plot on 21st September, 1950, gave the following :—

	Lucerne (After Japanese Millet).	Lucerne.
Plants—4 square links	2 9	0 7

while moisture sampling of the subsoil at the 18–24 inch level on the same date gave the following :—

Lucerne (After Japanese Millet).	Lucerne.
%	%
16·5	14 8

(Difference required for significance at 5 per cent. level was 1·6 per cent.)

What is the correct interpretation of these results? In the opinion of the writer, some advantage to the lucerne stand is gained by a preliminary summer-irrigation treatment. The choice of the particular summer-irrigated crop grown is probably of little importance except in regard to considerations of harvesting and utilization of the crop. For general purposes, Japanese millet is a suitable crop because—

(*a*) it can be fed off, cut as hay, or stripped for seed;

(*b*) it can be harvested for hay by mowing and raking or cut with a binder;

(*c*) there is no danger of stock-poisoning.

Other summer forages, such as sorghums, are:—

(*a*) inadvisable to feed off in an immature stage owing to risk of poisoning;

(*b*) difficult to cut for hay with ordinary machinery;

(*c*) hand-harvested for seed.

The use of an annual crop, whether winter or summer growing, prior to establishment of lucerne, is sound policy from the point of view of securing good grading and layout.

It is interesting to record that pasture sowings on Kerang clay gave better establishment following a crop of sorghum than when sown without a preliminary crop, at plots at Tragowel (1940).

(*j*) Better Grading

Poor penetration of irrigation water may be associated with sidefall and other defects in grading. It will be readily understood that, during irrigation of a bay showing sidefall, the water covers the high land last and drains off it first. The total time for infiltration to occur is thus reduced, and lucerne growing on soils of fair permeability may, under these conditions, exhibit the characteristic stunted harsh growth typical of soils of poor permeability.

The invasion of these areas by annual grasses and weeds (e.g., barley grass and pepper cress) is commonly noticed.

The use of banks of excessive height and width on red-brown earths has been criticized by the District Agricultural Officer, Cobram District (Mr. G. D. Duncan), on the ground that more than 10 per cent. of the area of a lucerne paddock may be of low or negligible production due to this practice, insufficient infiltration being obtained through the banks to promote healthy growth of the lucerne. (See photograph, this Journal, page 434, October, 1952.)

On some of the heavy grey soils of Kerang, Swan Hill, &c., however, where cracking of the banks is extensive on drying out, some loss of productive area due to solid check-banks is unavoidable if adequate control of irrigation water is to be maintained.

The points enumerated above provide additional sound reasons for careful grading and banking suitable to the soil type before the establishment of lucerne or permanent pasture.

Sheep grazing lucerne, Cobram area.

Commencement of cumbungi growth in dead-end channel.

WATER REQUIREMENTS OF LUCERNE

Victorian investigations of this aspect of lucerne growing commenced in 1914 (see Richardson—"The Water Requirements of Farm Crops"—Jour. Dept. Agric., Vic., 1923) at the State Research Farm, Werribee, using pot experiments and field trials, and at Rutherglen Experiment Farm.

In the pot trials, the aim was to determine the water requirement, expressed as a ratio—

$$\frac{\text{Water absorbed by plant}}{\text{Dry matter produced}}$$

called the transpiration ratio.

In the field trials, the water requirement was expressed in terms of inches of irrigation water applied per ton of dry matter or of hay (15 per cent. moisture) produced per acre.

The variability in water requirement, as ascertained by both methods, due to variation in meteorological factors (temperature, humidity, air movement, &c.) was demonstrated, and attempts to gain any more than an average figure were shown to be of little practical value.

(k) No Action

As shown by a comparison of soil probe readings at Mr. S. R. Johnson's plot in 1949 and 1952 (see Table 1, page 338, and Table 5, page 344, August, 1952, Journal), a considerable and satisfactory increase in penetration is the usual result of continued irrigation of some soils, and the result may be considered as an extension of the effect produced by the use of a summer-irrigated crop prior to lucerne establishment. (See section (*i*)).

Inadequate drainage has resulted in the loss of half the lucerne in this paddock.

The replication of the trials was insufficient judged by modern standards of experimental technique. Only two soils (clay loam, Werribee, and silt loam, Rutherglen) were used in the trials. After due regard has been paid to these defects in experimental design, however, the results of the tests are still of considerable interest, and are given in summarized form below :—

(i) Lucerne required approximately 8 inches of water to produce 1 ton of dry matter (of the 8 inches, 6¾ inches was transpired, and 1¼ inches lost in evaporation). This may be considered a medium water requirement, since according to Leppan—"Agricultural Policy in South Africa"—the requirement may vary from 4 to 14 acre-inches per ton of dry matter produced.

(ii) The amount of water transpired by lucerne increased continuously, reaching a maximum near time of cutting (early flowering).

(iii) During midsummer, the amount of water transpired per ton of dry matter produced is highest.

(iv) Time taken to produce a hay crop varied from 21 days in December-January to 39 days in October-November.

(v) 30 per cent. of the water required to produce a midsummer hay crop may be transpired in three days.

(vi) Maintenance of moisture content of soil at about 60 per cent. saturation gave best conditions for growth.

In field trials, during 1919–30, water requirements were measured on unreplicated plots, using a modified Dethridge wheel meter for water measurement from concrete channels, and measuring the produce as hay, sampled for moisture content at the time of weighing. The hay yields were then calculated to 15 per cent. moisture. The defect of lack of replications was to some extent compensated by the use of two sites for the trials. The sites used at the State Research Farm, Werribee, were—

(*a*) Field 2B S.W. (1919–24).

(*b*) Field 8 S.E. (1926–30).

(*a*) Field 2B S.W. (1919–24).

The plan of the experiment was as follows :—

Amounts of irrigation water varying from 18 to 48 inches per irrigation season were applied at rates (per irrigation) varying from 3 to 6 inches. The hay was sampled at weighing and the field weights recalculated, on the moisture percentage analyses figures, to 15 per cent. moisture. The results of the trials are shown in Figs. 2 and 3.

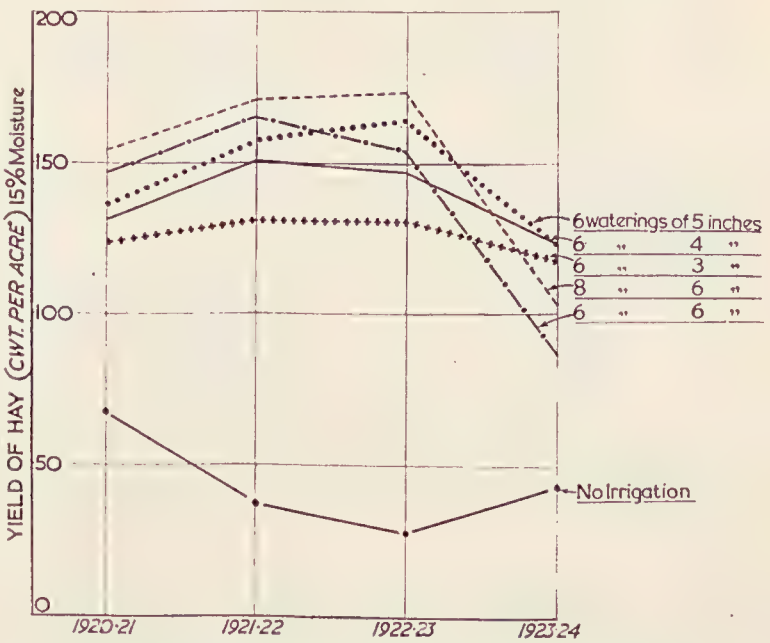


Fig. 2.—Yields of lucerne hay under different rates of irrigation, Field 2B S.W., State Research Farm, Werribee, 1919–24.

Total yield for four seasons (cwt. per acre) :—

6 waterings of 3 inches	503·5.	* 6 waterings of 5 inches	580·9.
8 „ „ 3 „	492·5.	* 6 „ „ 6 „	551·0.
6 „ „ 4 „	554·7.	* 8 „ „ 6 „	604·2.

* Water tables rose to 3 feet from surface in 1924.

Note :—Superphosphate, 2 cwt. per acre, applied except in 1923.

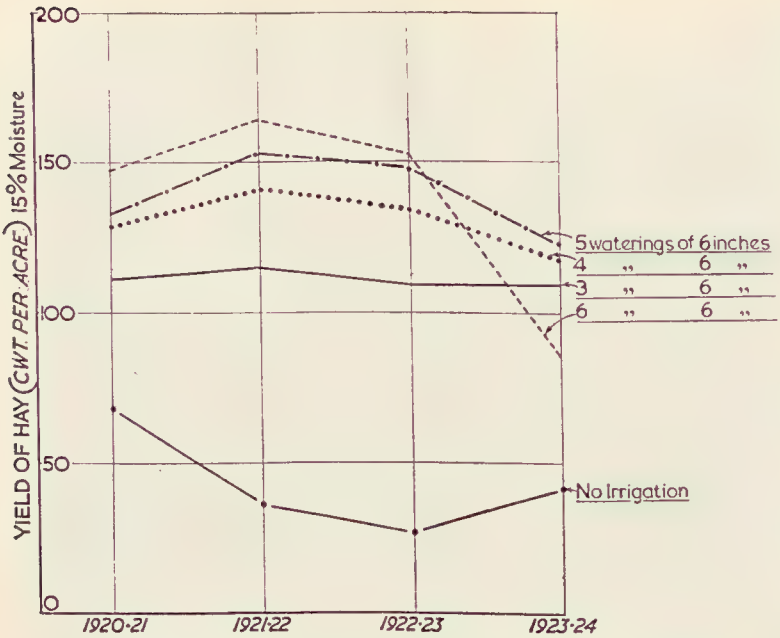


Fig. 3.—Yields of lucerne hay under different frequencies of irrigation, Field 2B S.W., State Research Farm, Werribee, 1919–24.

Total yield for four seasons (cwt. per acre) :—

3 waterings of 6 inches, 447·2. 5 waterings of 6 inches, 562·6.
4 „ „ 6 inches, 524·7. * 6 „ „ 6 inches, 551·0.

* Water table rose to 3 feet from surface in 1924.

Note:—Superphosphate, 2 cwt. per acre, applied except in 1923.

It was concluded that of the systems included in the trials the most satisfactory was "six waterings of 4 inches".

The factors taken into consideration in arriving at this conclusion were :—

(*a*) Sustained good yield and fodder value.

(*b*) No undue rise in water table.

NOTES.—On the soil type used for the trial, up to three consecutive irrigations were required to obtain the 4-inch absorption. The ill-effect of continued heavy irrigation in field trials was also shown in the pot trials.

(*b*) FIELD 8 S.E. (1926–30).

The watering trial at this site dealt with rates of watering only. The results are shown in Fig. 4.

The total requirement of water to obtain maximum growth of lucerne under the conditions at Werribee was, therefore, considered to be 2 acre feet in addition to the rainfall (average for 38 years = 19·94 inches). Most of this rain is received as light showers, spread fairly uniformly throughout the year. These rains are usually followed by strong winds, causing large losses by evaporation (annual evaporation from a free water surface is 45 inches).

Influence of Seasonal Rainfall Incidence

A strong influence of variation in seasonal rainfall incidence is shown by the "No Irrigation" yields (see Fig. 5).

On the plots receiving up to 2 feet of irrigation water, the irrigated plot yields were increased with good rainfall; with 30 inches of irrigation water, the total hay crop for the season was reduced by over 1 ton to the acre (see Fig. 4).

For reasons connected with soil variation, water distribution within districts, sudden onsets of hot dry weather, lucerne "scald", &c., the adoption of a set schedule, such as, the "six waterings of 4 inches", is not practicable. It is difficult to set out any rules for the timing of irrigations.

On a "watered as required" basis, the following points should be taken into consideration.

1. As moisture supplies become depleted, the lucerne becomes dark green in colour.

2. Very hot calm days are unsuitable for lucerne irrigation owing to the risk of "scald". It is better in the long run to forego an irrigation than to risk permanent injury by scald.

3. Night watering may be carried out to avoid "scald".

4. Irrigation *prior to* cutting hay is preferable, as it ensures a quick growth after the mowing.

5. In the hottest months, usually two irrigations will be required for each hay crop.

6. In the heavier soils, late autumn watering should be avoided if possible, as heavy rains following such irrigation may kill a large proportion of the plants. This effect is more severe on the flatter lands and in areas where high water tables are associated with irrigated lands. If late autumn watering is given, a margin of safety can be secured by cutting off the bays early so that the lower ends are not fully watered. Some absorption of rain water run-off is then possible, and the risk of drowning out the lower areas of the stand is reduced.

MANURING

Manuring was investigated at the State Research Farm, Werribee, and on a series of Northern district plots, during the period 1912–31. In these early trials, replication and statistical layout were not satisfactory according to modern standards. Repetition of the trials at other sites on the farm, and on plots throughout the Northern irrigation districts, supplied confirmation of major conclusions. The displacement of lucerne by permanent perennial pasture later resulted in concentration of work on pasture manurial investigations.

In 1914, it was considered that liming was important for successful lucerne culture. The manurial trials, therefore, included trials of liming at various rates, in combination with fertilizers (see Table 12).

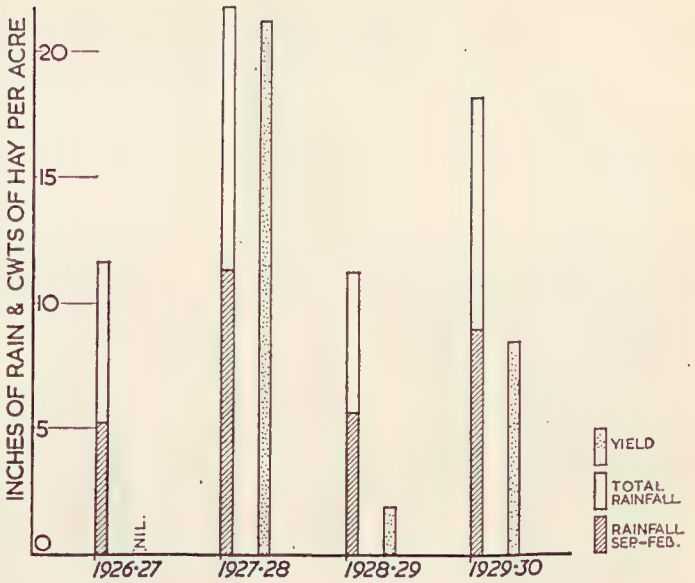


Fig. 5.—Rainfall and hay yields, "No Irrigation" plot, 1926-30, Werribee.

Note:—Figures given for rainfall for thesese asons, in State Research Farm Guide Book, are based on the period last cut of one year to last cut of next year.

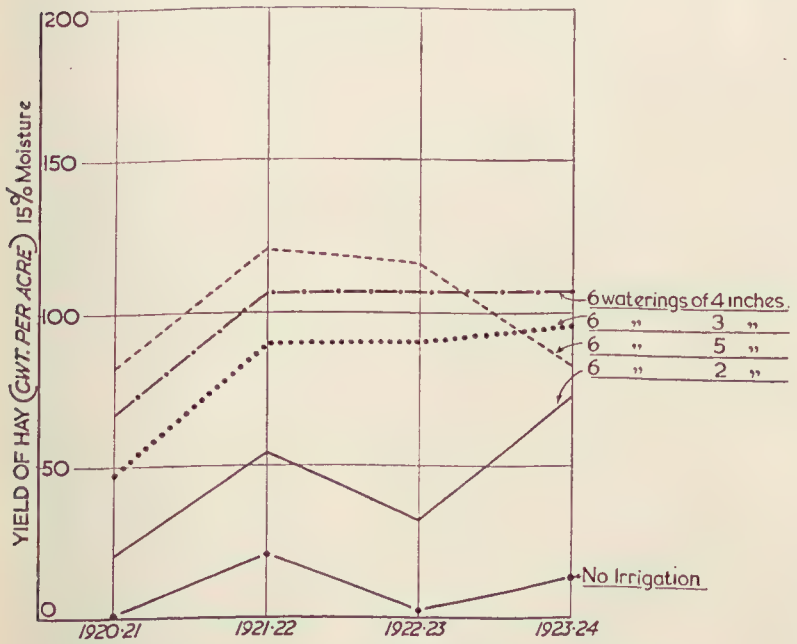


Fig. 4.—Yield of lucerne hay under different rates of irrigation, Field 8 S.E., State Research Farm, Werribee, 1926–30.

Total yield for four seasons, 1926–30 (tons per acre) :—

No irrigation	1·84.	6 waterings of 4 inches,	19·38.
6 waterings of 2 inches,	9·04.	6 " " 5 "	20·18.
6 " " 3 "	16·28.		

TABLE 12.—EFFECT OF LIME AND FERTILIZERS ON HAY YIELDS—LUCERNE FIELD 5 S.W., STATE RESEARCH FARM, WERRIBEE, 1914–18.

(Size of Plot = ·15 acre.)

Manurial Treatment (cwt./ac.)	Yields of Air-dried Hay Per Acre.				
	1914–15.*	1915–16.†	1916–17.	1917–18.‡	Average.
	cwt.	cwt.	cwt.	cwt.	cwt.
Lime 20, stable manure 200	109·0	103·6	101·6	85·4	99·9
Lime 20, super. 2, blood manure 1	113·6	98·8	100·2	78·5	97·8
Lime 20, super. 2, nit. soda 1	119·1	93·6	103·2	70·4	96·6
Lime 20, super. 2	108·3	84·8	111·5	67·9	93·1
Lime 20, super. 2, pot. sulph. 1	102·8	105·6	94·9	64·6	92·0
Super. 2	111·0	81·6	98·3	60·8	87·9
Lime 40, super. 2	104·2	96·8	75·0	70·6	86·7
Lime 20, Thomas' phosphate 2	104·2	85·6	90·6	64·4	86·2
Lime 20, bone fertilizer 2	107·8	81·6	88·4	56·7	83·6
Ground limestone 36	96·8	73·6	90·6	59·1	80·0
Lime 20	103·8	66·8	80·1	63·7	78·6
No manure	92·7	64·8	71·9	49·1	69·6

* = five cuts; † = four cuts; ‡ = three cuts.

Lime applied 1913–14 and 1914–15.

Other manures applied 1913–14, 1914–15, 1916–17.

Plots running across the bays.

After grazing closely with sheep in August, plots cultivated in two directions with fixed-tyne cultivator.

TABLE 13.—EFFECT OF FERTILIZERS ON HAY YIELDS—LUCERNE FIELD 2B S.W., SECTION N.E., STATE RESEARCH FARM, WERRIBEE, 1920–24.

(Size of Plot = ·053 acre.)

Plot No.	Manurial Treatment (cwt./ac.).	Lucerne Hay Yield (15 per cent. Moisture) in cwt. per acre.				
		1920–21.	1921–22.	1922–23.	1923–24.	Average.
					*	
1	No manure	110·5	122·7	96·5	76·0	101·4
2	Rock phosphate 1	132·7	130·6	108·4	74·1	111·4
3	Sulphur 1	139·5	140·3	108·4	69·8	114·5
4	Basic slag (= Super. 2)	131·2	147·6	122·7	84·5	121·5
5	Bone fertilizer (= super. 2)	126·9	140·9	122·2	88·0	119·5
6	Ground limestone 18	129·7	144·9	107·2	67·3	112·1
7	Ground limestone 36	132·9	149·4	105·8	63·2	112·8
8	No manure	135·0	137·2	103·1	63·1	109·6
9	Super. 1	135·7	149·5	122·6	68·0	119·0
10	Super. 2	135·4	158·4	137·0	80·6	127·8
11	Super. 3	133·7	162·3	143·0	84·1	130·7
12	Super. 4 (in two applications)	141·5	165·0	148·2	89·9	136·2
13	Super. 2, gypsum 30	148·5	176·2	149·8	90·0	141·1
14	Super. 2, lime 10	133·2	147·9	135·5	86·7	125·8
15	Super. 2, lime 20	133·1	158·7	136·9	93·1	130·4
16	Super. 2, sod. nitrate 1	109·4	142·6	133·0	86·8	117·9
17	Super. 2, sod. nitrate 1, pot. sulp. 1	117·9	142·5	128·7	85·6	118·7
18	Stable manure 200	113·4	142·2	125·8	84·7	117·0
19	Stable manure 200, lime 20	123·0	157·0	131·5	91·6	125·8
20	No manure	106·5	132·9	107·2	70·6	104·3

* Manures not applied.

Plots running *across* the bays.

TABLE 14.—EFFECT OF FERTILIZERS ON HAY YIELDS—LUCERNE FIELD 2B S.W., SECTION S.E., STATE RESEARCH FARM, WERRIBEE, 1920–24.

(Size of Plot = ·056 acre.)

Bay No.	Plot No.	Manurial Treatment (cwt./ac.).	Hay Yield (15 per cent. Moisture) in cwt. per acre.				
			1920–21.	1921–22.	1922–23.	1923–24.	Average.
1	1	Rock phosphate 1	98·2	134·8	100·3	96·3	107·4
	2	No manure	108·7	126·5	100·4	84·0	104·9
	3	Sulphur 1	99·1	132·9	103·4	91·0	106·6
2	4	Basic slag (Super. 2)	89·5	114·7	105·2	103·7	103·3
	5	No manure	90·9	115·4	93·1	82·1	95·4
	6	Bone fertilizer (super. 2)	102·6	134·1	114·3	93·2	111·0
3	7	Ground limestone 18	109·3	134·8	107·6	82·7	108·6
	8	No manure	86·9	119·9	102·2	80·8	97·4
	9	Ground limestone 36	91·1	121·2	107·2	87·7	101·8
4	10	Super. ½	95·5	118·2	100·5	86·0	100·0
	11	No manure	87·4	115·6	92·3	83·1	94·6
	12	Super. 1	95·6	125·6	111·4	106·0	109·6
5	13	Super. 2	94·4	123·4	114·1	102·9	108·7
	14	No manure	87·2	122·2	98·5	91·5	99·8
	15	Super. 3	88·1	124·5	116·7	111·2	110·1
6	16	Super. 4 (in two applications)	111·9	138·0	121·8	111·9	120·9
	17	No manure	96·2	123·1	103·7	91·3	103·6
	18	Super. 2 + gypsum 30	111·5	141·7	133·1	111·5	124·4
7	19	No manure	101·2	119·7	98·0	82·3	100·3
	20	No manure	101·6	120·6	96·8	79·9	99·7
	21	No manure	103·6	133·6	106·6	95·0	109·7
8	22	Super. 2 + lime 10	102·9	131·9	111·1	112·5	114·6
	23	No manure	96·3	113·9	103·0	93·6	101·7
	24	Super. 2 + lime 20	110·5	153·2	121·9	123·6	127·3
9	25	Super. 2 + sod. nitrate 1	103·9	126·6	107·1	103·5	110·3
	26	No manure	95·9	124·9	104·7	92·3	104·4
	27	Super. 2 + sod. nitrate 1 + pot. sulph. 1	102·6	131·6	114·3	105·3	113·4
10	28	Stable manure 200	101·5	148·5	130·0	118·3	124·6
	29	No manure	87·1	135·1	116·3	110·7	112·3
	30	Stable manure 200 + lime 20	94·0	163·6	130·1	126·5	128·6

Three plots per bay, plots running *down* the bays.

The results of fertilizer trials in Field 8 S.E., State Research Farm Werribee, have been given earlier in this series (see Table 4).

The following tables show the results obtained in Northern irrigation districts.

TABLE 15.—HAY YIELDS—LUCERNE PLOTS—G. A. MAJOR'S, COHUNA, 1926–31.

(Size of Plot = ·08 acre.)

Plot No.	Manurial Treatment (cwt./ac.).	Hay Yield (15 per cent. Moisture) in cwt. per acre.					
		1926–27.	1927–28.	1928–29.	1929–30.	1930–31.	Average.
1	No manure	89·7	44·6	52·6	37·7	34·5	51·8
2	Super. 1	95·1	49·5	60·1	48·2	45·7	59·7
3	Super. 2	93·4	49·1	62·5	56·9	50·1	62·4
4	No manure	86·3	39·1	39·1	30·6	27·9	44·6
5	Super. 4	105·8	60·1	72·0	66·5	59·1	72·7
6	Super. 4 (in two applications)	99·9	57·1	73·3	67·9	59·0	71·4
7	No manure	85·2	41·2	45·6	38·2	33·1	48·7
8	Super. 2 + lime 20	103·2	57·0	68·6	61·2	54·1	68·8
9	Super. 2 + gypsum 20	111·1	57·7	71·3	64·9	55·0	72·0
10	No manure	107·5	52·0	53·1	44·9	36·2	58·8
11	Super. 2 + pot. sulph. 1	107·0	56·5	71·9	69·4	61·0	73·2
12	Bone fertilizer 2	96·9	47·4	55·1	49·1	44·1	58·3
13	No manure	88·6	45·4	46·3	41·6	31·0	50·6

Soil: 0–5″ brown-grey, light silty clay loam, pH 6·6; 5–10″ grey-brown, light medium clay (silty), pH 7·8; 10–57″ yellowish-brown-grey, silty light clay, pH 8·6; 57″ yellowish-brown-grey, silty clay loam, pH 6·3.

TABLE 16.—HAY YIELDS—LUCERNE PLOTS—J. BULLINGHAM'S, TONGALA, 1925–31.

(Size of Plot = ·08 acre.)

Plot No.	Manurial Treatment (cwt./acre.).	Hay Yield (15 per cent. Moisture) in cwt. per acre.						
		1925–26.	1926–27.	1927–28.	1928–29.	1929–30.	1930–31. †	Average.
1	No manure	84·1	91·6	72·3	73·3	70·7	54·9	74·5
2	Super. 1	84·5	98·8	94·3	89·6	97·5	79·2	90·6
3	Super. 2	84·1	101·7	103·1	96·9	114·5	93·1	98·8
4	No manure	67·4	76·3	61·8	57·2	55·6	55·6	62·3
5	Super. 4	90·4	115·2	117·8	115·4	128·0	108·2	112·5
6	Super. 4 (in two applications) ..	86·6	113·1	114·6	108·8	123·8	104·2	108·6
7	No manure	59·2	62·0	53·0	48·1	44·1	49·9	52·7
8	Super. 2 + lime 20*	77·5	99·2	104·3	98·7	103·0	100·6	97·2
9	Super. 2 + gypsum 20*	75·4	94·7	101·3	94·8	103·6	100·7	95·1
10	No manure	56·2	60·5	55·6	54·2	45·0	54·8	54·4
11	Super. 2 + pot. sulph. 1	77·8	88·9	101·3	92·3	95·9	94·5	91·8
12	Bone fertilizer 2	60·4	72·6	71·4	68·6	73·8	69·8	69·4
13	No manure	55·9	53·9	46·1	40·1	38·0	45·1	46·6

* Lime and gypsum applied 1925 and 1929 only. † Four cuts only.

Soil: 0–5″ red-brown sandy loam; 5–16″ red clay; 16–22″ red clay; 22–42″ yellowish silty clay.

TABLE 17.—HAY YIELDS—LUCERNE PLOTS—S. MASTERS', SWAN HILL, 1924–28.

Plot No.	Manurial Treatment (cwt./ac.).	Hay Yield (15 per cent. Moisture) in cwt. per acre.				
		1924–25.	1925–26.	1926–27.	1927–28.	Average.
1	No manure	58·5	61·1	47·8	51·4	54·7
2	Super. 6	141·9	176·3	183·0	161·4	165·7
3	Super. 3	106·7	146·1	152·6	131·6	134·2
4	No manure	67·8	72·7	57·1	62·7	65·1
5	Super. 2	101·2	123·4	120·2	101·8	111·6
6	Super. 4	122·9	159·1	161·4	139·1	145·6
7	No manure	77·5	83·3	73·3	78·0	78·0
8	Super. 2 + lime 20*	112·5	138·3	135·8	115·3	125·5
9	Super. 2 + gypsum 30*	118·5	148·6	139·1	122·4	132·2
10	No manure	74·7	78·2	64·5	70·6	72·0
11	Ground rock phosphate 2	79·1	83·9	84·1	86·6	83·4
12	Bone fertilizer 2	87·4	91·1	82·3	79·7	85·1
13	No manure	79·8	71·3	51·2	58·4	65·2

* Lime and gypsum applied 1924 and 1927 only.

Soil: grey soil typical of Murraydale flats.

At all experimental sites, the superiority of superphosphate as a fertilizer for irrigated lucerne was demonstrated, and the Department has consistently recommended that at least 4 cwt. per acre per annum be used.

The tables also indicate some benefit from lime or gypsum at Swan Hill and Cohuna.

Insoluble phosphates gave negligible increases in yield.

A further instalment of this article will appear in a subsequent issue of the Journal.

PORTABLE EQUIPMENT FOR THE PIGGERY

Mobile Shed, Self-Feeder, Water Trough

By G. C. GRIFFITHS, Pig Husbandry Adviser

At the annual field day for farmers held at the Longerenong Agricultural College, visitors were very interested in new equipment exhibited at the college piggeries. The equipment included a shelter shed, feeder, and drinker, all movable and designed for use where pigs are kept in paddocks and fed mainly on grain. To enable farmers keeping pigs under those conditions to copy this equipment, if they so desire, Mr. G. C. Griffiths, Pig Husbandry Adviser, has prepared the following plans, specifications, and illustrations of the shed, feeder, and drinker.

IN a piggery the lay-out, equipment, and housing employed vary from one farm to another. They should, however, be designed to provide adequate comfort for the pigs and be convenient to operate.

Whether the housing, water, and feeding facilities should be of permanent construction or movable, will depend largely on climatic conditions, location of the piggery, and the class of foodstuffs used. Usually, when a large number of pigs are concentrated on relatively small areas of valuable land, and bulky foodstuffs are fed, these facilities are fixtures.

Portable piggery equipment, Longerenong College.

On the other hand, portable equipment can be efficient when concentrated foods, such as grain, are used to feed the stock, and where relatively small herds of pigs are kept. The chief advantages of using portable equipment, combined with the open-air or open-range method of pig keeping, are as follows—

1. The capital outlay is usually less, especially if materials available on many farms, or procurable at little expense, are utilized for construction.

2. Labour involved in cleaning out sites, and time spent in daily attention to the animals, is greatly reduced. Where pigs have access to self-feeders and can readily obtain drinking water, the only labour time spent is in the re-filling of feeders and water tanks. This job is one which does not have to be carried out daily. The attention they need each day is limited to an inspection of the equipment to see that it is functioning properly.

3. Pigs can be run over new ground which is to be improved for agricultural purposes through the droppings of the stock. With no fixed buildings to interfere with cultural and croppings operations areas can thus be brought into production as the land is cleared and improved.

Portable pig house at Longerenong.

4. Where pastures are available, a rotation of the grazing is practicable by moving pigs, housing, and equipment from paddock to paddock as the need arises. This permits maximum use of young grasses and clovers. It also ensures against spoiling of the land and pasture by the stock, a frequent occurrence where no rotation is practised.

5. By maintaining the animals on fresh ground and continually changing the areas, worm and other parasitic troubles are practically eliminated.

Mobile equipment must be light, stand up to the rigors of constant moving, and be sufficiently durable to withstand the depredations of weather and the stock.

An important factor to be considered is the initial capital cost. This must be kept as low as possible consistent with the purpose for which the equipment is designed. If cumbersome and heavy, mobile houses tend to become fixtures and this defeats the purpose for which they are constructed. Feeding and watering appliances are likewise subjected to constant wear and tear, both from the pigs themselves, and in transporting from one area to another.

Mobile equipment, designed and constructed at the Longerenong Agricultural College, Dooen, possesses most of the qualities necessary for the comfort of the stock, convenience in operation, and the durability required for successful use. The housing, watering, and feeding equipment, described and illustrated in this article is used at the college for sows with litters and for growing pigs to bacon weight.

MOBILE UTILITY PIG SHED

The shed is of timber framework covered on the outside with sheets of Solomit, a manufactured straw board two inches thick and consisting of wheaten straw tightly compressed and wire-bound. This is affixed to the studs with 3-inch flat-head nails, driven through small strips of galvanized sheet-iron to act as washers, and nailed through the straw into the studs.

The shed is mounted on two red gum bearers 9 ft. x 4 in. x 3 in. these act as "runners," enabling the shed to be moved easily. The roof, of gable construction, is also covered with Solomit, which is water-proofed by painting with tar or a bituminous preparation after the sheets have been secured in position.

Solomit is light in weight, has excellent insulation properties against heat and cold, and costs considerably less than either timber or iron. To prevent damage to the outside walls due to pigs biting at or rubbing against the straw-board, 17-gauge galvanized wire-netting 42 in. x 1½ in., is tightly stretched over the outside of the straw and secured in position in the same manner and at the same time as the sheets are affixed to the studs. The outside dimensions of the completed shed are 8 ft 4 in. by 6 ft. 4 in., with an overall height, to the top of the ridge, of approximately 8 ft 3 in.

Protection from damage by the pigs to the inside of the shed is provided for by spacing 6 in. x 1 in. hardwood boards two inches apart, and nailing them horizontally to the studs. This lining is carried to a height of 3 ft 2 in. above floor level around three of the walls. The fourth, behind the hover, does not require boarding above the height of this fixture.

Ample draught-free ventilation is provided by means of fixed louvres at each end of the building, and a space of approximately seven inches between the top of the side walls and the roof. To provide the extra space, top wall plates are constructed higher than the top of the solomit sheets. This is an essential feature to provide ample air space in hot weather, such as is normally experienced at Longerenong in the summer.

Entrance to the shed is gained by use of a sloping ramp. This ramp is hinged to the bottom plate with two 12-inch heavy-duty "T" hinges. When lifted, and secured in position by means of a rail on the outside, it becomes a closely-fitting door. The door is closed when it is desired to confine a farrowing sow, or move the house from one area to another.

When the shed is used for farrowing purposes, the sloping floor, built in three movable sections, is placed in position a few days prior to the sow's due farrowing date. It is inadvisable to put the sloping floor in position immediately the sow is placed in the yard as she may then refuse to enter the shed. If allowed to enter the house and camp on the fixed floor a few times before the sloping sections are placed in position, no difficulty will be experienced in getting her accustomed to the slope before she farrows.

The movable sections are taken up a few days after the litter is born. This will allow both the sow and her piglets full use of the shed without restriction. The risk of the youngsters being overlaid by their mother after this time is negligible, as they will naturally congregate under the hover for protection.

When not in use, the floor sections are stacked on their edge on top of the hover, the guard rail preventing interference by the sow. In this position, they will be out of the reach of any stock which may be housed in the shed, yet ready for use whenever required. The use of the house, with sloping floor in position, does not eliminate the need for at least some attention being given to the sow at the time of farrowing, or during the day or two afterwards.

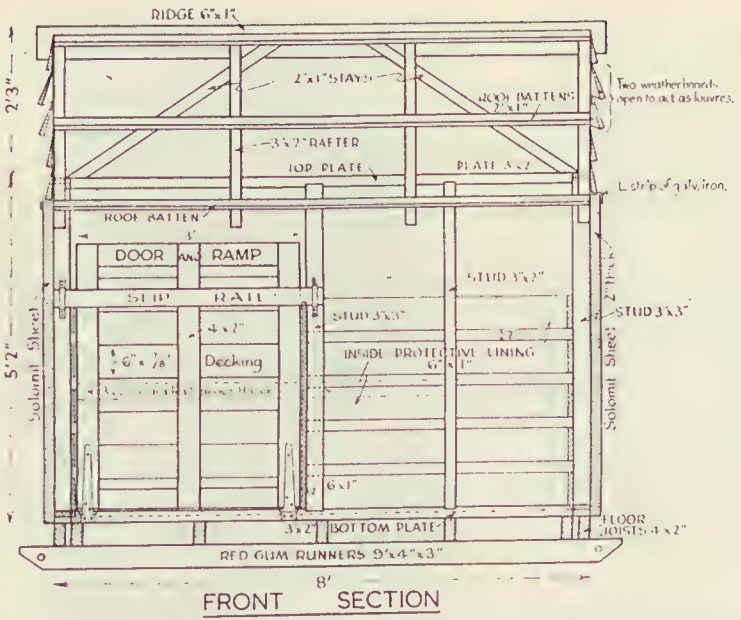
Some sows will farrow in the shed without attention and show no desire to farrow elsewhere, especially when the weather is cold or it is raining. Other sows, however, may want to farrow outside when it is fine and warm. For this reason it is advisable to shut the sow inside the shed, overnight, if there is any doubt regarding her behaviour at the time farrowing is due to commence. This will ensure against losses should she give birth to the litter before the expected time.

Apart from the removal of cleanings at the end, little attention need be given during the actual parturition period, unless the sow actually experiences difficulty in giving birth to the litter. After farrowing is completed it is advisable to leave her undisturbed for some hours. The door may then be opened and the sow induced to leave the shed for a drink.

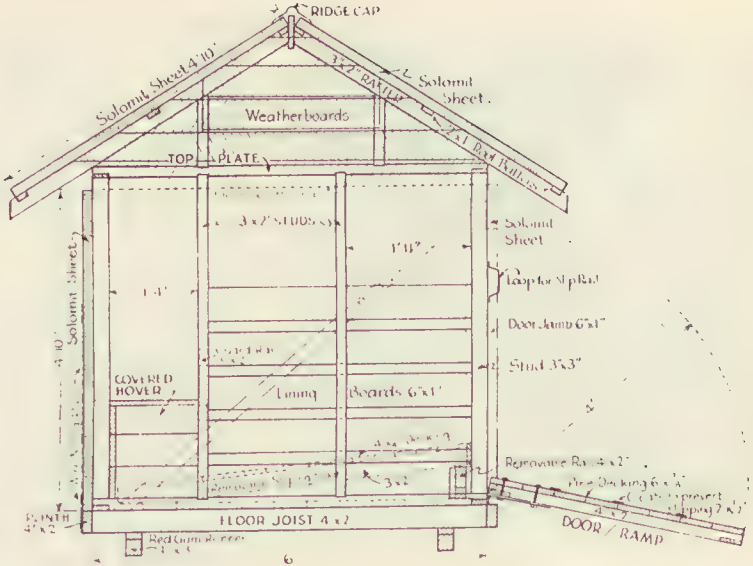
The ramp should be raised while the sow is outside, otherwise some of the young pigs may wander out and find difficulty in returning to the shed. This procedure is only necessary for a day or two. At the end of that time, the youngsters will be strong enough to walk up and down the ramp without difficulty, and the door may then be left open.

Details for use in the construction of the house are given in the plans. These, together with the photographs and the list of materials used in its construction, should enable any handy-man to erect a similar shed.

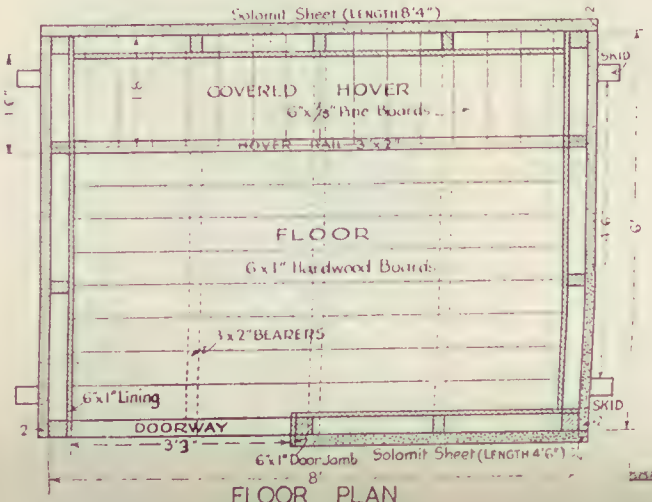
The utility house in use. The ramp enables the young pigs free access and egress.



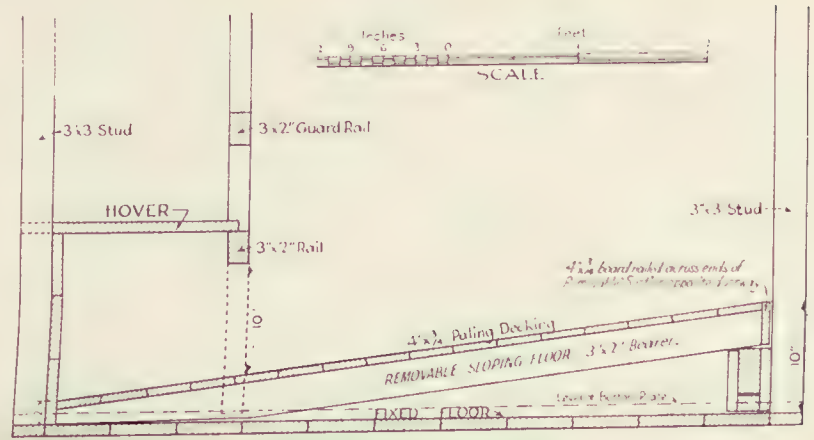
FRONT SECTION



END SECTION



FLOOR PLAN

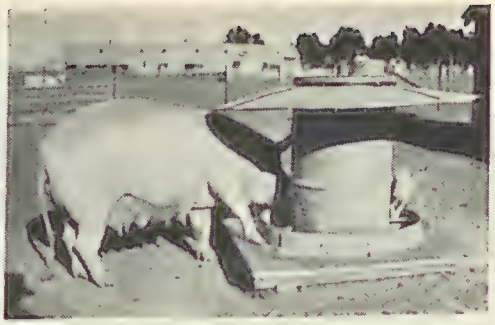


SCALE OF FEET

ENLARGED SECTION
Showing Sloping Floor in relation to Hover.

Materials Required for Construction of Mobile Pig House.

Red-gum bearers	2— 9′ x	4″ x 3″
Hardwood Step (dropped in doorway to provide step-up when sloping floor is in place)	1— 3′ 3″ x	4″ x 3″
Hardwood	7— 6′ x	4″ x 2″
,,	1—13′ x	4″ x 2″
,,	1— 8′ x	4″ x 2″
,,	1 - 7′ x	4″ x 2″
,,	1— 7′ 6″ x	4″ x 2″
,,	5— 5′ x	3″ x 3″
,,	6— 8′ x	3″ x 2″
,,	4— 6′ x	3″ x 2″
,,	8— 5′ 3″ x	3″ x 2″
,,	1 4′ x	3″ x 2″
,,	7— 5′ 6″ x	3″ x 2″
,,	8 5′ x	3″ x 2″
,,	14— 7′ 6″ x	6″ x 1″
,,	1— 9′ x	6″ x 1″
,,	10— 4′ 4″ x	6″ x 1″
,,	5— 4′ x	6″ x 1″
,,	1— 3′ 2″ x	6″ x 1″
,,	1—10′ x	6″ x 1″
,,	6— 8′ x	2″ x 1″
,,	2— 7′ 6″ x	2″ x 1″
,,	1 - 9′ x	2″ x 1″
,,	2 4′ x	2″ x 1″
,,	2—10′ x	2″ x 1″
,,	1— 6′ x	2″ x 1″
,,	4— 3′ x	2″ x $\frac{1}{2}$″
Hardwood sawn palings	25— 6′ x	4″ x $\frac{3}{4}$″
Pine flooring	16— 1′ 8″ x	6″ x $\frac{3}{4}$″
,,	8— 3′ 3″ x	6″ x $\frac{3}{4}$″
Pine weatherboards	2— 6′ x	7″
,, ,,	2— 6′ 9″ x	7″
,, ,,	2— 5′ 6″ x	7″
,, ,,	3— 4′ x	7″
Solomit sheets	1— 8′ 6″ x 4′ 10″ x	2″
,, ,,	2— 6′ x 4′ 10″ x	2″
,, ,,	1— 4′ 6″ x 4′ 10″ x	2″
,, ,,	2— 8′ x 4′ 10″ x	2″
Heavy-duty "tee" hinges	2—12″	
26-gauge ridging	1— 9′	
Wire-netting	26′ x 42″ x 1½″ x 17 g.	
Nails	3 lb.—3″	
,,	4 lb.—2″	
Sheet iron (this is used for flashing and for the washers)	1— 6′ x 3′ x 26 gauge	
Bolts, cup head, with nuts	8—3½″ x ¼″	



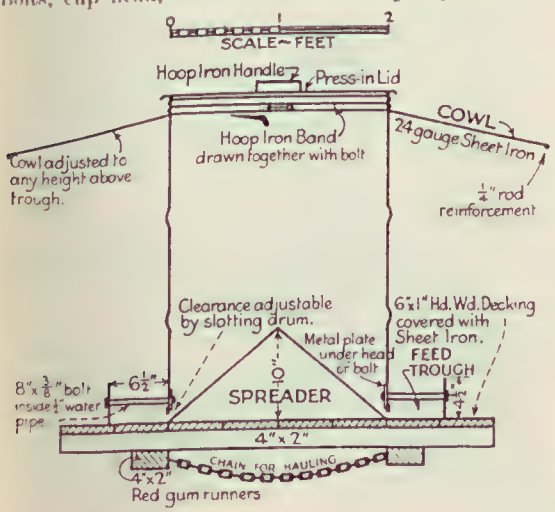
The portable self-feeder at Longerenong piggery (see plan hereunder).

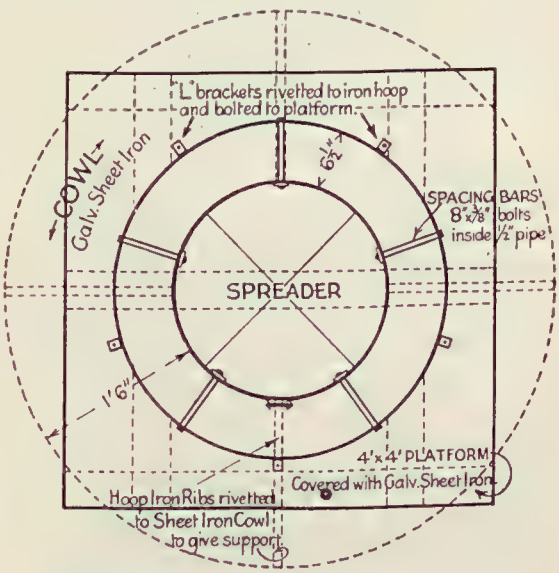
PORTABLE SELF-FEEDER

The feeder, constructed from a 44-gallon oil drum from which both ends have been removed, is mounted on a 4-ft. x 4-ft. wooden platform for ease of transport. The platform is covered with galvanised sheet iron to prevent wastage of the food dropped outside the trough and to provide a clean feeding area for the pigs.

The trough of the feeder, illustrated, was constructed from the metal tyre of a disused main driving wheel from a reaper and binder. Cleats attached to the outside were removed and also the spokes. The tyre was cut in half around its circumference by means of an oxy-acetylene torch.

Each half of the tyre is already provided with twelve holes drilled through it. Six of these holes are used to take bolts which comprise the spacing bars and secure the drum to the tyre. The remainder are used when rivetting on short




L brackets rivetted to iron hoop and bolted to platform
COWL
Galv. Sheet Iron
6½"
SPACING BARS 8"x⅜" bolts inside ½" pipe
SPREADER
1'6"
4'x4' PLATFORM
Covered with Galv. Sheet Iron
Hoop Iron Ribs rivetted to Sheet Iron Cowl to give support

Plan of portable self-feeder for pigs (a converted 44-gallon drum).

Shelter is provided for sow and piglets on the Longerenong piggery.

"L" brackets, which enable the tyre to be bolted to the platform to give rigidity to the whole feeder and prevent it being moved by the pigs.

Before the bolts are secured in position, a 6½-in. length of ½-in. water pipe is slipped over each bolt to act as a spacing check between drum and tyre. Under the head of each bolt, and placed on the inside of the drum, a 4-in. length of 1-in. x ⅜-in. bar iron, suitably drilled to allow the bolt to pass through, is set in position to act as a supporting leg. Perpendicular slots are cut in the drum, where the bolts pass through, to allow adjustment of the height between the bottom of the drum and the platform. This permits regulation of the feed and prevents wastage. As the slots are covered by the metal plates, no food can leak through at these points.

If the feeder is used under a shed, no lid or cowl will be necessary to provide protection from the weather. In an open paddock, however, protection must be provided if spoiling and wastage of the food is to be avoided. A press-in lid constructed from galvanized sheet iron and fitted with a hoop-iron handle and a cowl made from similar materials will give adequate protection.

The height of the cowl is adjustable by slackening the bolt which holds the hoop-iron band around the drum, slipping this and the cowl down to a lower level, if necessary, and re-securing it in position.

The capacity of the feeder when completed is two 3-bushel bags of feed. This quantity of food is sufficient to provide all that a sow and litter will require for one week. Apart from refilling at intervals, the feeder will require little attention, the 10-in. cone in the bottom of the drum ensuring an uninterrupted flow of food into the trough.

PORTABLE AUTOMATIC WATER TROUGH

Designed to provide a constant supply of clean drinking water where no other water is laid on to the yard, this automatic watering device can be employed as a fully mobile unit or as a permanent fixture near a hose or tap. On farms where water is carted, much time and energy can be saved by the use of such a device.

The water trough requires no attention apart from refilling at intervals, and the pigs have a supply before them when they need it. As with the self-feeder, a 44-gallon oil drum is used as the holding tank, but, unlike the feeder, both the top and bottom of the drum are intact. It is important that only a sound drum be used and that the two screw-in bungs at the top be leak-proof when placed in position.

The drum is placed on its end in the centre of a shallow, circular, corrugated, iron tank of approximately 3 feet 8 inches in diameter and 6 inches deep. The whole

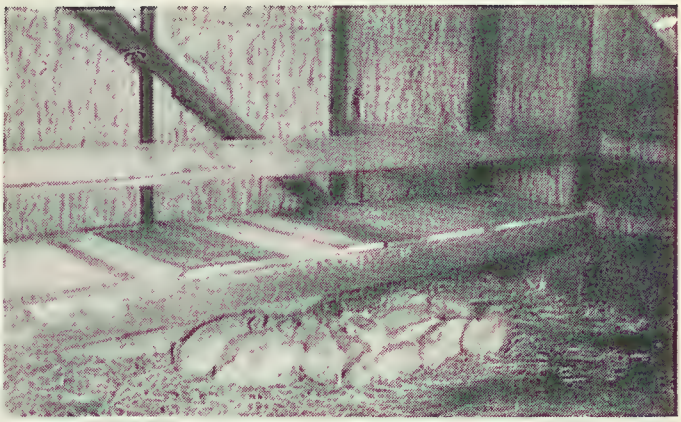
The portable automatic water trough.

is placed on top of a 4-ft. x 4-ft. wooden platform mounted on two 4-in. x 3-in. red-gum bearers.

Twelve braces, constructed from hoop-iron of the type used around corn-sack bales, are arranged symmetrically around the circumference of the drum and riveted to a hoop-iron band. This band is drawn tightly together with a bolt. The ends of each brace extend to the outer top-edge of the tank and are secured in position with galvanized roofing bolts. The braces, in addition to holding the drum in a fixed position, provide separate drinking compartments and prevent the larger pigs getting into the trough.

A ½-in. outlet is punched through the side of the drum 1½ inches from the bottom rim; if a better job is desired, a ½-in. barrel-union is welded into the side of the drum.

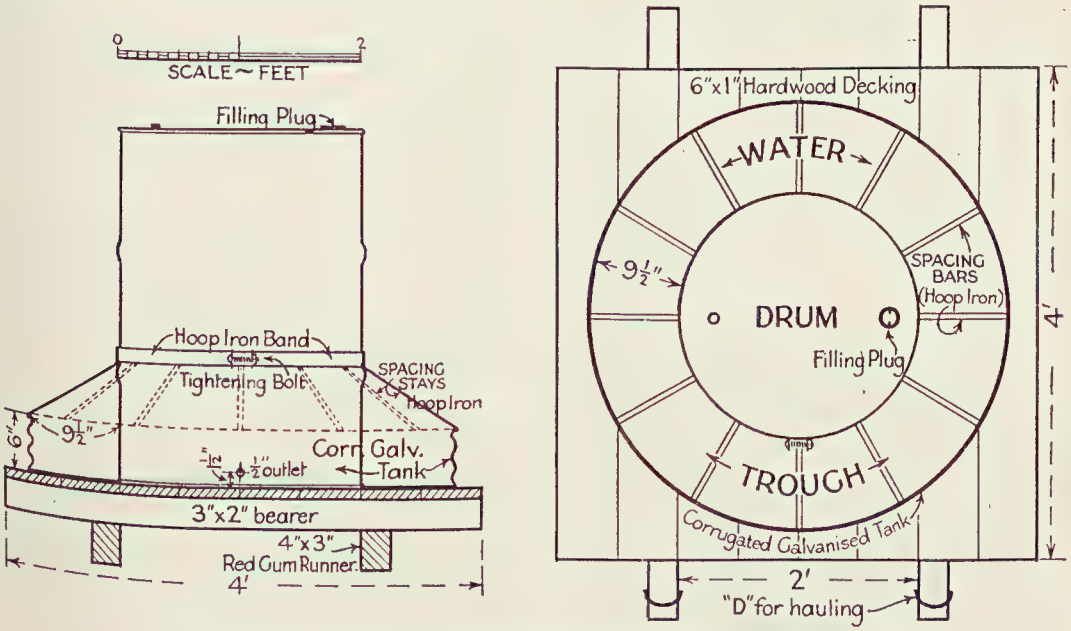
To fill the drum, it is drawn to the nearest source of water supply, a plug is placed in the bottom hole, the large bung at the top is unscrewed, and the drum filled to capacity. Before placing it in service, the large bung on top is replaced and screwed down tightly, and the small plug removed from the bottom hole. After the first rush of water from the drum, the water in the tank will remain at the one level—approximately 2 inches deep—until the drum is empty.



This photograph shows the sloping floor of the mobile utility house in position and the litter protected by hover.

Such a watering device will serve pigs of all ages and, because of the shallow depth of water, suckling pigs cannot drown if they fall into the trough.

In actual use at Longerenong, it was found that, to supply a sow and her litter of ten pigs during normal summer weather, the drum had to be refilled at weekly intervals. Cleaning is easily accomplished by tipping the drum and trough on to one side when the last gallon or two of water remains in the trough. Slime and dirt may be removed with a scrubbing brush before the water is tipped out.



Plan of automatic water trough (44-gallon drum in shallow tank.)

Dairy Production Improvement Competition

By K. M. SILLCOCK, B.Agr.Sc., Senior Dairy Husbandry Officer

A new competition for dairy farmers, to be conducted this year conjointly by the Department of Agriculture and the Victorian Herd Improvement Association, will take the place of the Dairy Farm Management Competition formerly conducted by those bodies. It will be known as the Dairy Production Improvement Competition. In keeping with today's need for increased dairy production, the competition has been designed to recognize and encourage farmers who are increasing the output of their farms.

Conditions of the Competition

JUDGING will be done in accordance with the following conditions and terms of reference :—

1. The prize will be awarded to the competitor who, in the opinion of the judges, has achieved the most creditable increase in total butterfat production, having regard to the conditions under which the increase in production was obtained and the extent to which sound husbandry and business principles were observed.

2. The increase in total butterfat production from the testing year 1951–52 to the testing year 1952–53, expressed as a percentage of the total production for the first season, shall be used as a basis in judging the entries, but the prize will not necessarily be awarded to the competitor who achieves the greatest percentage increase in production. As the object of the contest is to increase production by the encouragement of better farming methods and honest endeavour, the judges shall make due allowances for any influences which tend to bestow unearned credit or advantage on any competitor.

3. The percentage increase in production for a competitor may be adjusted to eliminate purely seasonal influences if there has been a change in the general level of production in the herd test unit of which he is a member, and any other needed adjustments may be made.

4. Returns, such as account sales, showing quantities of milk and cream sold by a competitor may be examined and used as the judges consider necessary.

5. When, after suitable adjustment, a competitor's production increase figures show that he is a possible prize-winner, the judges will visit his farm to ascertain in what manner the increase in production has been achieved, and the competitor shall give the judges all the information they require relating to this increase.

6. The decision of the judges shall be final.

Competition Open to All Herd Test Association Members

The competition is open to all members of herd testing associations, and there is no entry fee. The first prize, the "Welch Perrin Prize", consists of a silver trophy and farm equipment to the value of three hundred and fifty pounds, donated by the firm whose name it bears. Substantial prizes are also provided for second, third, and fourth placings.

As in former competitions, the Commonwealth Fertilizers and Chemicals Ltd. Perpetual Challenge Shield will be offered for competition and will be held for one year by the herd test zone with the best team of four competitors. Replicas of the shield, also donated by the same firm, will be awarded to members of the winning team.

The closing date for competition entries is June 30. Entries may be handed to herd test association secretaries or posted direct to the Secretary, Victorian Herd Improvement Association, Temple Court, 422 Collins-street, Melbourne, C.1.

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

TIDINESS ON THE FARM

FARMS nowadays are tidier than they used to be and this is probably due in part to the use of labour-saving machinery and to the fact that general basic improvements—clearing, pasture establishment, fences, and buildings—have been completed or have reached the stage when the farmer can devote more time to keeping his property in apple-pie order. On such a farm it is much easier to put good farming methods into practice and to produce high-quality milk, cream, eggs, or other perishable products than on an untidy farm.

It might well be asked what comprises tidiness! It is the absence of fallen timber and other rubbish, the housing of farm machinery, the maintenance of fences, gates, and buildings in a good state of repair, attention to plantations, hedges and gardens and elimination of sprawling wood and junk heaps. The finishing touches to a tidy farm are neat drives and laneways, clean drains, absence of quagmires at gateways, well-painted buildings, gates and railings.

Clean up Those Nails and Metal Scraps

Tidiness saves labour and reduces the likelihood of breakdown of machinery and of injury to employees and stock.

In their proper places, nails, staples, tacks, and screws and bolts are assets, but, sticking out of buildings, gateposts and the like, they frequently tear clothes and the flesh of humans and animals, or those sticking up through boards on the ground or floors may puncture feet and tyres.

Nails dropped on the floor of the feed room or on hay are likely to be swallowed by stock, causing internal blockages and penetrations. Small pieces of barbed, baling, or fencing wire may also be swallowed.

Hardware poisoning is the American term given to internal injuries caused by stock swallowing nails, wire or other metallic substances and the losses from this cause are large.

Wire lying about may be responsible for tripping people and animals, causing broken limbs, sprains and gashes. It may also be drawn into machinery, breaking mower knives and causing other damage.

Broken Fences

Loose or broken wires in fences which have fallen into disrepair also are a source of loss. Fences around calf pens and calf paddocks are often the poorest on a farm and, at an early age, the calves learn to get through fences. This habit grows as the calves develop and they force their way through fences, leading other stock through.

Barbed wire may cause costly damage to cows' udders when fences fall into disrepair and stock try to get through or over them.

One may still find many broken-down fences, which should be demolished or repaired, with the stock tramping across them in the weakest places, getting caught up in the wires, or the cows tearing their teats and udders. With good fences there is no rounding up of stock which have got out of a paddock.

Gates

Gates have always been a problem on many farms. In some cases their weight pulls the post over, causing the gate to drag when it is being opened, or the fence wires may pull the posts back preventing the gates from being fastened. The farmer who has every gate working freely usually has everything else on his farm in good order.

Boxthorn hedges make good windbreaks, but the thorns cause injuries to animals, particularly dairy cows. Another common cause of injury to cows' teats and udders is the long dew-claw which may cut the teats and lower portions of the udders of newly calved or springing cows. Such dew-claws should be trimmed.

Old Machinery

Old machinery becomes a problem on many farms. If left in the paddock where last used, it is in the way of stock and is frequently run into with new machinery, causing breakdown of the more valuable equipment. If it is stacked in a machinery yard, grass and weeds grow up through it, harbouring snakes and other vermin, and creating a fire menace in dry weather. Old machinery should be dismantled and the parts stacked away neatly or it should be sold as junk. Too much old machinery is hoarded for its "parts value." New machinery should be kept in a machinery shed.

Good sheds with doors easily opened and shut are as necessary as good fences and gates. To preserve the life of buildings, they should be painted regularly and the spoutings kept in good order.

Grass along drives, around buildings and in plantations should be grazed short as a protection against fires as well as for tidiness. Young plantation trees must be protected during grazing. On nearly every farm a small flock of wethers could be kept as "lawn mowers." They would soon become very tractable and could be used later as ration sheep. [A.C.T.H.]

PURE-BRED BULL DISTRIBUTION PLAN

The price paid for bulls sold through the Pure-Bred Bull Distribution Plan was increased last December to meet the rising cost of rearing them. A sustenance allowance of £1 for each month or portion thereof that a bull offered to the Department is retained by the owner prior to allotment, up to a maximum of £12, is now paid.

As previously pointed out, these bulls are made available to dairy farmers who are having difficulty in obtaining finance to conduct their farms. Most of the applicants are persons who have just purchased dairy farms.

Jersey bulls are more readily available through the plan than bulls of other breeds, and of the 57 bulls sold for the six months ending December 31, 1952, 42 were Jerseys, 4 Friesians, 3 Red Polls, 3 Dairy Shorthorns, 2 Guernseys, 2 Australian Illawarra Shorthorns and 1 Ayrshire. [A.C.T.H.]

PIG CARCASS COMPETITION

The Australian Meat Board bacon pig carcass competition will be conducted again in 1953 on lines similar to last year's competition.

Each year since their inception, these competitions have grown in importance and received more support from the pig industry. Information gained from the competitions has enabled many pig raisers to produce better pigs with less food.

So attractive are these competitions that more farmers are expected to compete this year. Entry is free, pigs are purchased by the bacon company at full market rates and a trophy and twelve cash prizes with a total value of over £100 are made available by the Meat Board.

Any pig breeder who normally sells his pigs in Victoria may enter the competition, and the pigs may be pure-bred or crossed. An entry comprises one pig whose cold dressed carcass weighs not less than 120 lb. and not more than 180 lb. Either one or two entries may be made by each competitor.

The Gippsland Co-operative Bacon Curing Co., Dandenong, has again made its factory and services available to the competition committee. The pigs will be received at the factory for slaughter any time from April 20 to May 22, 1953. They may be

Display of carcasses in a previous pig carcass competition.

delivered to the Dandenong factory by competitors, or the company's agents will receive them at their buying and loading centres in the country.

Pigs will be killed and their carcasses stored until Friday, May 29, when they will be exhibited with the competition results at a public field day held at the bacon factory.

Entry forms should be obtained now from Mr. W. E. Dawson, State Representative, Australian Meat Board, 401 Collins-street, Melbourne, or from the Department of Agriculture, Treasury Gardens, Melbourne, C.2.

[L. A. DOWNEY, H.D.A., Pig Expert.]

"THE WOOL OUTLOOK"

The wool position is discussed from the points of view of production, overseas trade, consumption, stocks, competitive fibres and prices in "The Wool Outlook," a booklet available from the Commonwealth Bureau of Agricultural Economics.

The wool industry appears to be more stable now than it was twelve to eighteen months ago when prices were falling, following the boom which reached its peak in March, 1951. The anxiety as to how far prices would drop before they became stable was then very great. Wool prices are now said to be at levels in conformity with prices of other commodities. This gives reason to believe that a certain amount of stability has been reached.

About two-thirds of the world's wool is produced in six countries—Australia, New Zealand, South Africa, U.S.A., Argentina and Uruguay. The estimated number of sheep grazed during 1952 and the preliminary estimate of the wool to be produced in these countries during 1952–53 are shown below :—

	Sheep Numbers 1952.	Wool Production Greasy Basis 1952–53.
	millions.	million lb.
Australia	118	1,100
New Zealand ..	35	415
South Africa ..	31	250
U.S.A.	32	281
Argentina	50	410
Uruguay	23	187
World Total ..	744	4,030

Overseas trade in wool proceeded smoothly during 1951–52 ; consumption was equal to production and stocks were slightly lower than those held the previous year. The drop in wool prices during 1951 has reduced the immediate danger of competition from other fibres which, however, are being produced at high levels.

The average price of greasy wool sold in Australia during 1951–52 was 72·42d. per lb., only half the 1950–51 average, but still

higher than that for any other year. The average price of greasy wool sold in Australia during the past 26 years is set out below :—

GREASY WOOL PRICES, AUSTRALIA, 1926–1952.

Season.	Average Price per lb. (Greasy).	Season.	Average Price per lb. (Greasy).
	pence.		pence.
1926–27 ..	16·86	1939–40 ..	13·60
1927–28 ..	19·50	1940–41 ..	13·55
1928–29 ..	16·44	1941–42 ..	13·63
1929–30 ..	10·31	1942–43 ..	15·64
1930–31 ..	8·60	1943–44 ..	15·74
1931–32 ..	8·46	1944–45 ..	15·75
1932–33 ..	8·73	1945–46 ..	15·68
1933–34 ..	15·85	1946–47 ..	24·49
1934–35 ..	9·75	1947–48 ..	39·50
1935–36 ..	14·01	1948–49 ..	48·07
1936–37 ..	16·48	1949–50 ..	63·35
1937–38 ..	12·51	1950–51 ..	144·19
1938–39 ..	10·39	1951–52 ..	72·42

[A.C.T.H.]

CULLING, AND SELECTION OF POULTRY BREEDING STOCK

Accommodation in poultry pens and houses is heavily taxed at this period of the year, and poultry farmers are obliged to dispose of some of their adult birds or rearrange the accommodation of older birds to provide room for the early hatched pullets.

The problem arises each year, as most adult birds are still in production and breeders are loath to dispose of them while they are laying a profitable number of eggs. However, the pullets must have precedence over the older birds. They are a sounder economic proposition and, being more susceptible to disease than adult birds, should never be overcrowded.

It would be better to cull rather than over-crowd the old birds, as there will be some in poor condition, or extremely fat, or going off the lay. Birds showing the slightest sign of moult should be culled and sent to market. Other points to look for are dry, withering combs and wattles, excessive pigmentation in the shanks and beak, restricted abdomens and closely-set pelvic bones.

Where heavy culling is imperative, retain only those birds that are suitable for breeding. These should have deep, wedge-shaped, well-conditioned breasts ; long straight keels ; strong, flexible abdomens ; fine, strong shank-bones ; and clearly-defined, widely-set pelvic bones.

Fine bone is usually an indication of quality and speed, but it should be strong. Any tendency towards excessive fineness is a sign of weakness, and poultry farmers must be careful when selecting their breeders not to include birds with fine, pin-point pelvic bones that bend and sometimes break under slight pressure.

The shape, height, width and depth of the body is determined principally by the skeletal structure, which is the framework of the body. A bird is therefore as big, or strong, or fine, or coarse, as the texture and size of its bones.

When selecting breeding stock, poultry farmers should look generations ahead, and select for viability as well as egg production.

This is very difficult, particularly if there are no records of egg production and mortality available, but if the choice is made from healthy, active birds, with the desired conformation and good quality bone, it would be reasonable to expect some improvement in the progeny or at least a maintenance of present standards.

Birds with external faults should never be used for breeding. Some breeders may have evidence to show that certain faults in the present stock were not transmitted to the progeny, but that does not mean that they will not show up in subsequent generations. The soundest method of eliminating faults is not to breed from faulty stock.

[M. D. HALL, Poultry Expert.]

THE IMPORTANCE OF THE QUEEN IN THE HIVE

The queen of a colony of bees is undoubtedly its most important member. She is the mother of all of the bees, and without her, the colony would soon become extinct. She has no jurisdiction over the management of the colony, but is shown very great affection by the other bees in the hive who caress and fuss over her, feed her, groom her, and remove her faeces.

Structurally, she is much like the workers who are also females, but she is much longer in the body and therefore easily recognizable amongst the thousands of her progeny.

Her reproductive organs are fully developed, whereas those of the workers are not. Under stress of abnormal conditions, worker bees are capable of laying eggs, but they are not sufficiently developed to be capable of mating with drones (male bees) and their eggs are therefore not fertilized. These eggs will hatch and produce fully developed, though small, drones, but not worker (female) bees.

Worker bee, queen bee, and drone of the Italian Bee (enlarged).

It is frequently believed that the queen is a perfect and fully-developed female, but, while her reproductive organs are fully developed, she lacks many of the female characteristics and maternal instincts usually present in other females. While females in most other species nurture and care for their young, and perform all of the functions necessary for perpetuating their kind, the queen bee lacks this instinct and, having laid the egg, is incapable of doing anything more for it. The survival of the colony is dependent not only on the queen laying the eggs, but also on the nurse bees (young worker bees) performing the remaining maternal functions.

Apart from numerous other maternal duties, the nurse bees eat and partly pre-digest honey and pollen to make the larval food commonly known as " pap "—a white milky substance secreted from the pharyngal glands of the nurse bees for feeding to the young larvae. The number of visits made to a larva by the nurse bees until the time the larva is fully grown averages about 1,300 times a day.

The Queen is not a Shirker

It will therefore be seen that, while the worker bees are incapable of reproduction of their kind, they perform many of the functions usually carried out by the mother. This does not mean that the queen is a lazy creature and shirker of her duties. Far from it. She is really an amazing and extremely busy insect.

As she is the mother of thousands of bees it would be impossible for her to nurse all of the brood.

Normally there is only one queen in each colony. Shortly after emerging from the cell in which she grows to a fully developed insect, she learns to fly, and having taken orientation flights, usually within about ten days, makes her wedding flight. She is mated only once in her life-time and commences laying normally about four days later. From that time on she is an egg-laying machine, capable of laying up to 3,000 eggs in a single day. She may live for three years and often longer and, during the whole of this time she maintains the strength of the colony by her amazing egg-laying ability.

Her activities are governed by the amount of comb space the bees can provide for her and the amount of brood they can " nurse," which varies with the season and amounts of honey and pollen available. The quality and successful mating of the queen herself are of great importance to the commercial bee-keeper. After her mating flight she does not leave the hive again during her life-time unless to go with a swarm, when provision is made for a young queen to take her place.

The queen is capable of laying eggs without being mated and these eggs, as in the case of laying workers, will hatch and produce fully-developed male bees only. This is known as parthenogenesis or virgin development, and was discovered by Dr. Dzierson in 1853.

The queen lays fertilized or non-fertilized eggs at will, depositing the former in worker cells and the latter in drone cells. The eggs in the ovaries are all alike as to sex and are fertilized at will in the act of laying.

The importance of good quality queens and queen breeding will be discussed in a later issue of this Journal.

[C. D. Ilton, Apiary Inspector.]

LIVE STOCK IN VICTORIA

Geographical Distribution

5. SHEEP

By W. B. MILLER, M.Agr.Sc., Senior Inspector of Agriculture,
Victorian Department of Agriculture

An introduction to this series of articles on the geographical distribution of live stock in Victoria, together with Parts 1 (dairy cattle) and 2 (beef cattle), appeared in the October number of this Journal. Parts 3 (pigs) and 4 (horses), were published in our December issue.

THE distribution of 20 million sheep in Victoria at March 31, 1950, as shown on the accompanying maps, provides a good picture of the sheep this State may be expected to carry in a normal season; i.e., while the area devoted to cultivation remains at approximately 6·5 million acres, the cattle total some 2·2 million head, and until there is a further marked increase in the area of improved or irrigated pasture.

Since the disastrous drought of 1944–45, during which sheep numbers declined to 14·7 million, flocks in Victoria have been built up steadily, encouraged by good seasons, remunerative prices for wool, lamb and mutton, and increased usage of superphosphate for pasture improvement.

The estimated number of sheep in each statistical district of Victoria at March 30, 1951, is given in the table below. This shows the total of sheep (rams, ewes, wethers and lambs) and also the total number of breeding ewes divided into two categories, (*a*) those mated with Merino, Corriedale or Polwarth rams (mainly for wool production) nearly all of such ewes being fine wool types, and (*b*) those mated with rams of British breeds (mainly for fat lamb production) such ewes including a majority of cross-bred types. With current prices, however, the monetary return from the wool clip of a fat lamb production flock may exceed that from the sale of lambs.

SHEEP NUMBERS AT MARCH 31ST, 1951.
(to nearest 1,000)

District.	Total Sheep and Lambs.	Ewes Mated With: Merino, Corriedale and Polwarth Rams.	Ewes Mated With: British Breed Rams.
Mallee	1,303,000	203,000	563,000
Wimmera ..	3,029,000	846,000	324,000
Northern	3,548,000	609,000	1,324,000
North-Eastern ..	1,628,000	355,000	478,000
Western	5,926,000	1,752,000	435,000
Central	1,762,000	312,000	518,000
North-Central ..	1,663,000	370,000	320,000
Gippsland ..	1,153,000	244,000	256,000
	20,012,000	4,691,000	4,218,000

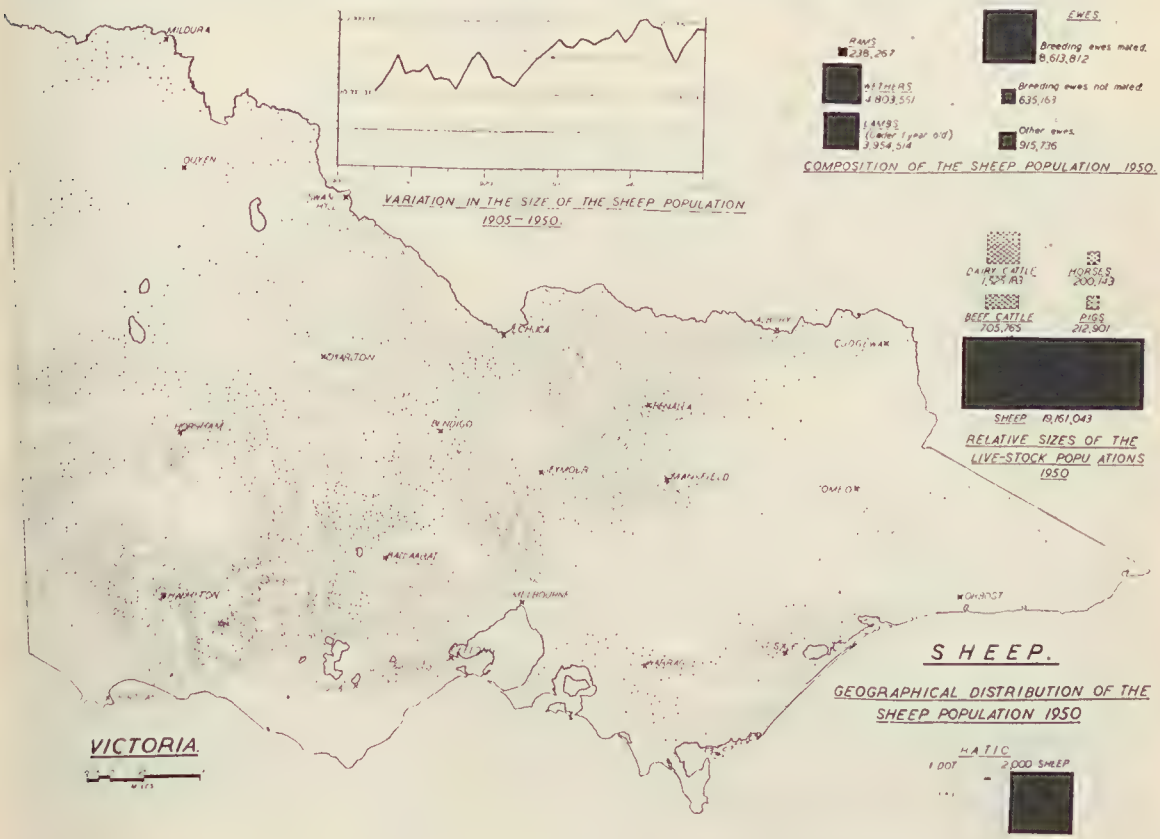
The rams most used in Victoria for fat lamb production are those of the Dorset Horn, Border-Leicester and Southdown British breeds.

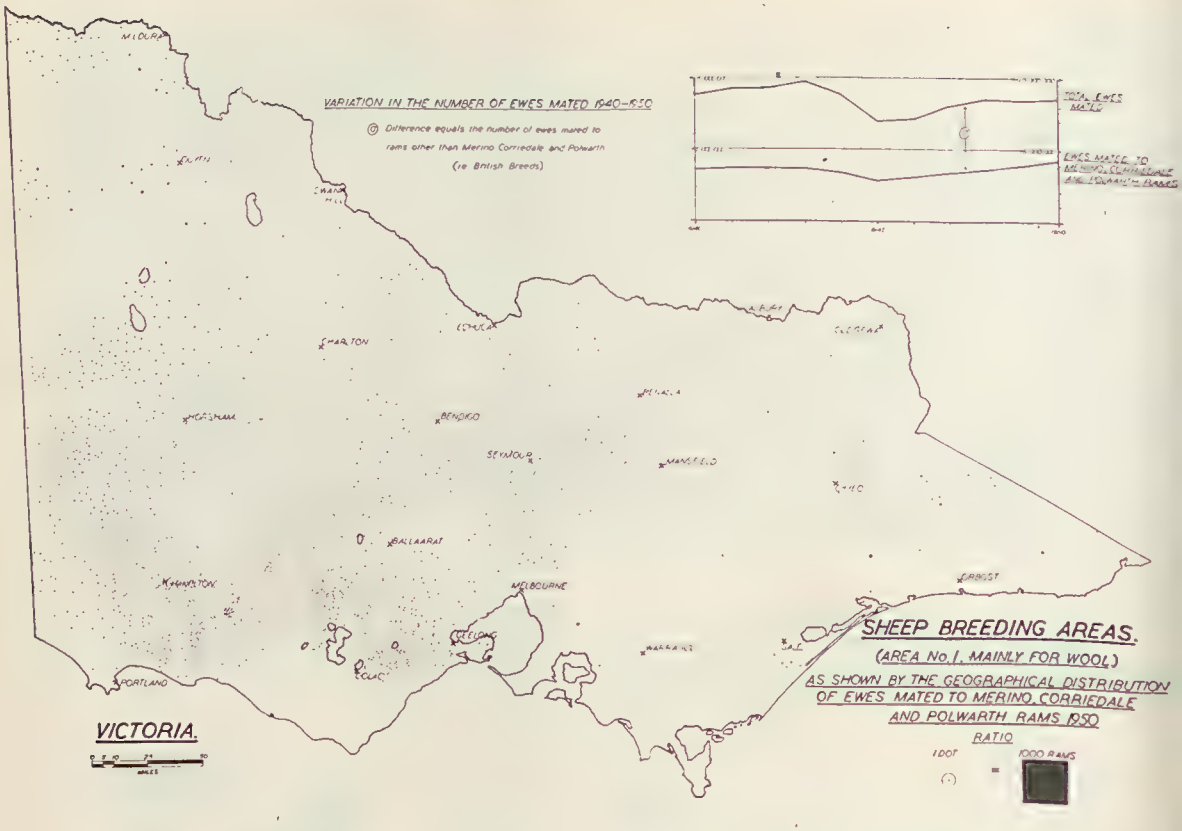
The maps clearly show the distribution of sheep in the various areas. They do not, however, indicate the stock carrying capacity of the pastures in each district, as the areas used for cultivation and the number of cattle carried influence the intensity or otherwise of the sheep population. The following are comments on sheep grazing conditions in each district.

Mallee

In the Mallee, the north-west corner of the State, where nearly half the Victorian wheat acreage is to be found, and also large areas of oat and barley land, most farms are used for both wheat and sheep.

The average annual rainfall is from 10 to 15 inches, and irrigated areas for sheep are negligible, except on the eastern fringe of the district. Sheep feed comprises perennial (mostly Danthonia) and annual grasses, clovers and medics, self-sown cereals, weeds and other herbage. In addition, large areas of oats are sown annually for grazing, and small areas of lucerne exist. In dry periods, hand feeding with grain or cereal hay is practised as necessary, although not more commonly than in the more southern areas.





Fat lamb production is dominant, although many of the larger flocks are kept mainly for wool growing. The district is noted for its early lambs, sired chiefly by Dorset Horn rams. The lambs usually commence to arrive at the Melbourne market by August. The wool from farms in this district carries a high percentage of dust and often much burr.

Wimmera

The northern half of the Wimmera District is the most fertile large wheat-growing area of Victoria, but sheep are an important source of revenue on all wheat farms, being used to graze the pastures and weeds on the paddocks not under crop or fallow. The average annual rainfall is from 15 to 19 inches with practically no irrigation for sheep pastures.

On the wheat farms in the north and north-eastern Wimmera, fat-lamb production is dominant, as in the Mallee, but to the west wheat growing is less intensive, and more fine-wool breeds are kept. Sheep feed is similar to that of the Mallee District.

The southern half of the Wimmera, with a higher rainfall from 20 to 25 inches (and more in the Grampians), is mainly grazing country with little cultivation. Wool growing taking precedence over fat lamb production. Both Merino and Corriedale breeds are commonly used. South-west of Horsham, near the South Australian border, much pasture improvement with subterranean clover and superphosphate topdressing has taken place, and considerable numbers of fat lambs are produced.

Northern District

The Northern District is second only to the Western District in the number of sheep carried, and produces about one-third of the fat lambs of the State.

The average annual rainfall varies from 15 inches in the west to 25 inches in the east of the district which includes the chief areas of irrigated pastures in Victoria, the water being obtained from the Murray and Goulburn river storages. Considerable numbers of sheep are kept on the wheat farms and also on uncultivated grazing land.

On the non-irrigated country, sheep feed comprises both perennial and annual grasses and clovers with much unbroken perennial grass country in the south of the district. The rainfall is insufficient to warrant much pasture improvement work except to the south-east, where subterranean clover with superphosphate is utilized. On the irrigated areas, both perennial and annual species of grasses and clovers are sown.

Except on the western fringe, fat lamb production predominates; the number of ewes mated to rams of British breeds bring twice the aggregate mated to Merinos, Corriedales and Polwarths. Each year, but particularly in dry seasons, a great number of lambs bred on non-irrigated areas of Victoria and New South Wales are fattened on the irrigated pastures, and marketed in the late summer and autumn.

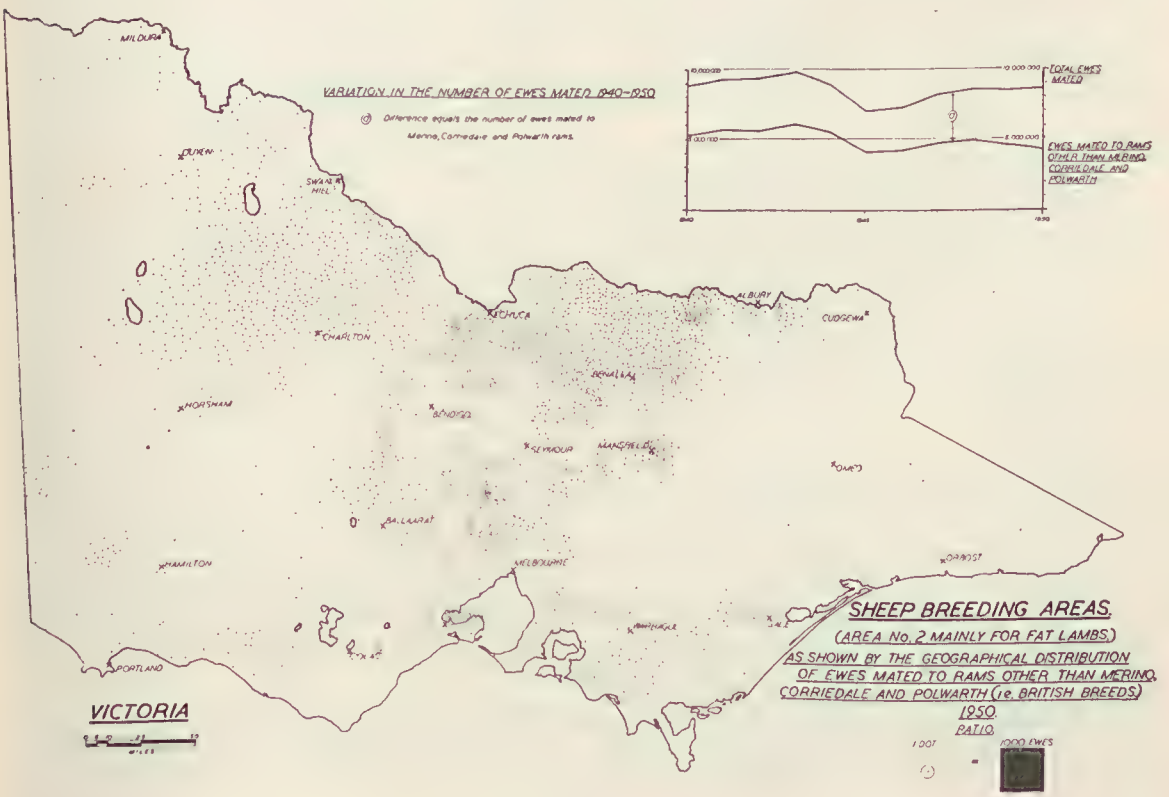
North-Eastern District

The sheep of the North-Eastern District are to be found principally in the 22 to 30 inch rainfall zone, on the foothills of the Great Dividing Range and on the flatter country between these highlands and the Northern District to the west, with the Murray River to the north. Where pasture improvement has been practised, two to three ewes per acre are commonly carried and fat-lamb production is usual. On unimproved country, and some of the improved, fine-wool growing is followed. On the lowlands in the north of the district, cereal growing under the clover-ley farming system has been adopted in conjunction with fat-lamb raising. The majority of farmers with much improved pasture are fat-lamb producers.

Western District

Some six million sheep are carried through the year in the rich Western District, mainly north of the chief dairying areas in the south. The average annual rainfall varies from about 23 inches in parts of the north and south-east to over 30 inches in the south and west, and is very reliable.

The pastures range from some unimproved Danthonia native grasslands in the central and northern sections, to highly improved perennial grass and clover pastures common throughout the higher rainfall areas,



but the greatest area of improved pasture includes topdressed subterranean clover with various proportions of perennial and annual grasses. Merinos are predominant in the Western District, with Corriedales and Polwarths both occupying significant places, and fourth-fifths of the ewes are mated to rams of these three breeds.

As in the other districts where fine wool growing is the main objective of sheep husbandry, a big proportion of the flocks, about one-third, consists of wethers. Many graziers use a portion of their flocks to rear fat lambs, which are also produced by many small farmers in the closely settled areas. These are available for market considerably later than those from the northern districts, where the season is earlier than the districts south of the Dividing Range. The breeding of crossbred ewes for fat-lamb production is not uncommon.

Central District

Sheep pastures in the Central District vary considerably, as the average rainfall increases sharply from 20 inches in the south-west to 40 inches near the mountains. In the drier sections, Merino sheep are favoured, fat lambs being produced more on the improved pastures in the north and east of the district where many cattle are also carried. On the Mornington Peninsula, also, fat lambs are produced in considerable numbers.

North-Central District

In the North Central District are to be found many excellent fat-lamb farms, but fine-wool production is more common, particularly on the lighter land. The average rainfall varies from 20 inches in the west to 30 inches in the east, and many of the pastures have been greatly improved by superphosphate and introduced species.

Gippsland

The pastures of west, central and southern Gippsland, where the rainfall is high, are used mainly for cattle, although a few sheep are to be found, the ewes being mated almost solely for the fat-lamb objective.

In east Gippsland, however, both on the hill and the lower country, many sheep are to be found. On the lighter or unimproved country, Merinos and Corriedales predominate, while fat-lamb production, using the Dorset Horn and Southdown breeds of rams, is commonest on the improved pastures in the 22 to 30 inch rainfall belt. In the highlands of north Gippsland, the sheep are predominately Merinos and Corriedales.

Recent Changes in the Geographical Distribution of Sheep in Victoria

In the early part of the century, a sheep population of 10 to 12 million was regarded as normal for Victoria. From 1921 to 1931 the numbers increased from 12 to 16·5 million, due to the remunerative post-war prices for wool and lambs, increased use of sheep on wheat farms, some extension of irrigated pastures and the developing practice of pasture topdressing with superphosphate. In the next ten years, pasture improvement on a large scale, encouraged by the availability of cheap superphosphate, increased the capacity of Victorian pastures so much that the record number of 20·6 million sheep were being carried in March, 1942. There was then little change in the sheep population until the drought of 1944–45, after which the numbers dropped to 14·7 million in 1946, recovering to 20 million in 1951, a good season in which a record number of both sheep and lambs were shorn, resulting in a record wool clip of 194·6 million lb.

Classified according to breeding Victorian sheep in March, 1951, were approximately 38 per cent. Merino, 32 per cent. Polwarth, Corriedale and Comeback, and 28 per cent. crossbred, with some 2 per cent British breeds.

In recent years, the production of fat lambs in Victoria has decreased despite the increasing total sheep population. This has been due to the greater increase in wool prices compared with lamb prices, the shortage of labor on the farms, transport difficulties and industrial disturbances at lamb marketing time. Statistics taken in March 1942, indicated the total number of ewes mated for lambing that year to be 9·4 million, of which 60 per cent. were mated with rams of British breeds. For lambing in 1951, only 47 per cent. of the 8·9 million ewes were so mated for fat lamb production, compared with 53 per cent. in 1949, the trend being towards wool production as the main objective.

This movement away from the production of fat lambs towards wool growing took place in each district, and is not likely to be

suddenly reversed. The nature of the ewe population has also changed during the past ten years towards a great proportion of fine-woolled ewes compared with first crosses between the Merino and long-woolled British breeds, of which the Border Leicester and Romney Marsh crosses are the most common. The main source of such ewes was, and still is New South Wales, where their breeding has decreased due to the swing towards wool growing. As such types are more suitable for fat-lamb production than are smaller-framed, finer-wooled ewes, their decreased numbers have an appreciable influence on the number and quality of fat lambs produced in Victoria.

Still further increases in the sheep carrying capacity of Victoria may be expected as the improved pasture and irrigated areas extend, and as the practice of conserving greater quantities of pasture or cereal hay and grain for use in lean periods is more widely adopted. Despite this, there will be fluctuations in the numbers due to variable seasonal conditions typical of the Victorian environment.

Sulphur Content of Dried Fruit

The Dried Fruits Processing Committee formed under the aegis of the Commonwealth Scientific and Industrial Research Organization and comprising representatives of the Federal Department of Commerce and Agriculture, State Departments of Agriculture, and C.S.I.R.O. Division of Food Preservation and Merbein Research Station, meets periodically to discuss technical aspects of fruit drying and processing.

This committee recently discussed the matter of sulphur dioxide content of dried fruits. It was pointed out that trials on the storage life of dried tree fruits had shown that with 7 and 14 grains of sulphur dioxide per pound of dried fruit, appearance and flavour deteriorated rapidly even if packed in sealed metal containers and especially when stored at higher temperatures. A satisfactory storage life approaching twelve months could only be obtained with 21 grains per pound.

At this time, State Health regulations provided maximum permissible limits of 14 grains per pound of dried fruit in New South Wales, Victoria, Queensland, and South Australia, and of 7 grains per pound in Western Australia and Tasmania.

It was resolved that representations be made to the State Departments of Health seeking approval of a maximum limit of sulphur dioxide in dried fruit at 21 grains per pound.

These approaches were successful and all States have now gazetted amendments providing a maximum permissible limit of 21 grains per pound. The amendments to the appropriate regulations were gazetted on the following dates:—Western Australia on 14th December, 1951, Victoria on 19th December, 1951, New South Wales on 15th February, 1952, Tasmania during February, 1952, South Australia on 10th July, 1952, and Queensland has advised that although no amendment has yet been gazetted, no objection will be raised to a maximum limit of 21 grains per pound of sulphur dioxide in dried fruit in the meantime while their Food regulations are being remodelled.

PASTURE SEED CERTIFICATION

List of Growers and Registered Areas Approved for Season 1952–53

Seed Certification Schemes are in operation in Victoria in respect to the following species and strains of pasture seeds : Victorian Perennial Rye Grass ; Victorian Phalaris Tuberosa ; Bacchus Marsh Early Flowering Subterranean Clover ; Mt. Barker Mid-season Flowering Subterranean Clover ; Tallarook Late Flowering Subterranean Clover ; and Victorian Irrigation White Clover.

Growers with areas approved for 1952 53 are as follows :—

VICTORIAN PERENNIAL RYE GRASS

R.G.— 1. Wrathall, D. W., Tourello.
6. Toose, H. A., Smeaton.
9. Troup, W. M., Tourello.
10. Sewell, C. W. and Son, Kooroocheang.
17. Thomas, G. F., Ascot.
19. Pickford, C. A., Clunes.
20. Pickford, J., jnr., Clunes.
33. Toose, G. C. and A. W., Smeaton.
35. May, A. C., Smeaton.
47. Bunn, J. and Sons, Allendale.
52. Drife, T. W. H., Coghill's Creek.
54. Hives, J. H. and Son, Kingston.
57. Kinnersley Bros., Glendaruel.
93. Luhrs, C. R. Wendouree.
102. Higgins, F., Irrewarra.
118. Martin, H. L. Irrewarra.
119. Menzel, C., Armytage.
120. Menzel, R. K., Armytage.
125. Roache, J., Nalangil.
134. Rankin, A., Colac.
138. McCready, D., Ondit.
142. McDonald, J. J. and Sons, Birregurra.
147. Mackay, D. G., Irrewarra.
158. Spalding, J., Neales Bag, Colac.
167. Spiers, F. C., P.B., Colac.
173. Brien, A. J. and Sons, Birregurra.
205. Brady, F., Kyneton.
218. McPherson Bros., Box 65, Kyneton.
232. Thomas, L. R., Drummond.
251. Buchholz, L., Lismore.
306. Walton, W. A. Burrumbeet.
307. Robinson, E. J. Kooroocheang.
310. Risk, W., Ullina.
320. Mizzeni, W., Kooroocheang.
332. Nicholls, P. L., Kooroocheang.
343. Davey, J. M., Miners Rest.
345. Taylor, W., Kingston.
348. Seamons, W., Kooroocheang.
364. Fawcett, A. E., Clunes.
369. Dunn, R. W., Burrumbeet.
372. McIntyre, R. A., Mt. Bute.
406. Roache, D. J., Nalangil.
436. Stewart, G. M., Birregurra.
437. Bourke, J. M., P.B. 4, Colac.
450. Champness, P. L., Mt. Moriac.
468. Wilson, R., Colac.

R.G.—487. Higgins, J. J., Irrewarra.
489. McDonald, J. J. and Sons, Yeo.
490. Gelletly Bros., Birregurra.
501. Napthine, L. R., Armytage.
520. Gannon Bros., Muroon.
527. Darcy, M., Birregurra.
556. Lowry, J., Winchelsea.
567. McDonald, J. J., Birregurra.
581. Collins, R. G., Birregurra.
589. Tapp, N. M., Camperdown.
601. Hill, W. J., Mansfield.
606. Donaldson, R. A., Green Hills.
608. Parks, L. A., Mansfield.
609. Menzel, C. J., Tatyoon.
610. Newnham, R. C., Romsey.
611. Spinks, T. F., Lismore.
650. Mahony, J., Camperdown.
660. Cuthbertson, J., Cororooke.
663. Dufty, A. H., Winchelsea.
669. Maguire, A. J., Birregurra.
670. Worland, J. A., "Kinross," Winchelsea.
674. Worland, J. H., "Strathmere," Winchelsea.
676. Hayes, P., Birregurra.
681. Gubbins, J. W., Winchelsea.
682. O'Shannessy, T., Corunnun.

VICTORIAN PHALARIS TUBEROSA

P.T.— 17. Champness, P. L., Mt. Moriac.
23. Walter, H. G., Dookie.
25. Schurmann, Theo., Moutajup.
26. Simpson, J. R. and Sons, Moyhu.
27. Edgar, P. W. and Son, Harrow.
29. James, A. T., Warrenbayne.
30. James, H. W., Warrenbayne.
38. Love, W. T., Narre Warren.
47. Toose, G. C. and A. W., Smeaton.
49. Fletcher, C. I., Buffalo River South.
50. Gibb, J. T., Moyhu.
51. O'Rourke, J. W., Thornton.
52. Learmonth, L. W., Coleraine.
55. Calvert, W. and J. C., P.B., Myrtleford.
56. Taverniti, G., Tooradin.
61. Walker, K. D., Rosewhite.
62. Skehan, R. T., P.B., Wangaratta.
63. McDonald, H., Moyhu.
64. Ahern, J. L., Pakenham South.
66. Peterson, C. A. J., Rythdale.
72. Burston, S. E. W., Casterton.
77. Johnstone, B., Byrne Free Bag, Wangaratta.
79. McPherson, W., Warrenbayne.

P.T.— 80. Johnstone, W. E., P.B., Myrtleford.
84. Walker, H. and L., Rosewhite.
86. Reichstein, R. W., Apsley.
89. Napthine, L. R., Armytage.
90. Darcy, M., Birregurra.
94. McPherson, A. J., Warrenbayne.
98. McDonald, D. R. and Sons, Caldermeade.
110. Hardy, J. L., Apsley.
111. Tapp, N. M., Camperdown.
112. Crocker, G. M., Violet Town.
119. Beggs, A. R., Beaufort.
121. Goyder, W. G., Apsley.
125. Hayes, A. M., Violet Town.
129. Hay, L., Colac.
131. Hopkins, J., Winchelsea
132. Carmichael, C. K., Casterton.
135. Artaud and Mair, Box 33, Frankston.
136. Simson, D. and Co., Casterton.
137. Walter, K., Moutajup.
138. Friday, F. W., Box 65, Mansfield.
139. Thomas, C. C., Box 34, Mansfield.
140. Casey, J. J., Narre Warren.
141. Smith, W. G., Bradville, via Skipton.
142. Mather, G. J., Nathalia.
143. Ewart, A. M. and Sons, Wahring.
144. Spalding, R. B., Lara.
145. Seymour, R., Balmoral.
146. Tetley, W., P.B., Wangaratta.
147. O'Connor, V., Cobram.
148. Summers, L., Moyhu.
149. Worthington Bros., Edenhope.
150. Habel, Mrs. W., Stavely.
151. Taylor, F. S., Beaufort.
152. Read, A. H., Beaufort.

BACCHUS MARSH EARLY FLOWERING SUBTERRANEAN CLOVER

B.M.— 1. Toose, G. C. and A. W., Smeaton.
3. Toose, H. A., Smeaton.
4. Koch, L. T., Wando Dale, Casterton.
6. Kennedy, E., Arcadia.
12. Sim, L. S., Cosgrove.
26. Murphy, E., Yundool.
27. Pendlebury, J., Katamatite.
28. Walter, H. G., Dookie.
40. Shields, J., Myrniong.
41. Lidgerwood, C. W., Yundool.
42. Lidgerwood, C. W., Yundool.
43. Ryan, J., Yabba North.
44. Browning, R. D., Yarrawonga.
46. Ryan, W. J. and W. L., Burramine East.
47. Petschack, F. A., Dookie.
48. Ballantine, J. G., Cosgrove.
49. Boothby, W. B., Peechelba East.
50. Buzza, W. T., Box 25, Cobram.
51. Lowe, D. G. M., Roadside, Pine Lodge South.
52. Lowe, D. S., "Waverly," Roadside, Shepparton.
53. Kennedy, M. T., Caniambo West.
54. Hendy, F. E., "Penzance," L.B., Numurkah

MT. BARKER MID-SEASON FLOWERING SUBTERRANEAN CLOVER

M.B.— 7. Lee, W., Lismore.
8. Cross, E. P., Beaufort.
16. Koch, L. T., Wando Dale, Casterton.
18. Smith, N. R., Lang Koop.
19. Smith, F. S. M., Lang Koop.
25. Walker, K. D., Rosewhite.
26. Walker, H. and L., Rosewhite.
35. Hood, R., Edenhope.
38. Murray, C. M., Telangatuk.
42. Dufty, T. P., Box 6, Lismore.
51. McMahon, B. M., Boralma, via Springhurst.
52. Hawkins, A. J. and C. E., Langley P.B., Goroke.
53. Goyder, W. G., Apsley.
56. Smith, D. A., Skipton.
62. Whittaker, A. M., Apsley.
65. Fleming, J. S., Mininera East.
67. Jenkins, A. G., Apsley.
68. Porter, A. F., Apsley.
70. Russell Bros., Toolondo.
72. Lawlor, J. P., Katunga.
73. Adams, C. M. and Sons, Neuarpurr.
75. McKellar, E. and A., Lang Koop.
76. Grey, A. J. H., Glenorchy.
80. Thomas, W. L., Apsley.
82. O'Keeffe, T. P., Pine Lodge.
83. Millard, M. (Mrs.), Lang Koop.
84. Millard, V., Lang Koop.
85. Wagenknecht, E. H., Edenhope.
87. Jewell, R. J., Edenhope.
88. Lukies, O. A., Katamatite.
90. Wilkinson, S. L. and Sons, Caniambo.
91. Martinich, P. J., Apsley.
93. Day, R. A. J., Lang Koop.
98. Currington, H., Warncoort.
99. Baker, John, Springhurst.
100. Campbell, M., Lang Koop.
101. Charles, G., Foxhow.
102. Bond, R. L., Apsley.
103. Malcolm, J. S., Box 79, Penola, S.A.
105. Smith, W. G., Bradville, via Skipton.
108. West, D. Edenhope.
109. Irving, H. V., Kybybolite.
110. Queale, H. K., "Glenleith," P.B., Horsham.
111. Pahl, D., Lang Koop.
112. McDougal, J. E., Edenhope.
113. Knight, R. F., Rutherglen.
114. Conrick, R., Powers Creek.
116. Cameron, D., Apsley.
117. Sowden, C. F., Naracoorte.
119. Goode, D. W., Coleraine.
121. Carter, D. W., Box 38, Edenhope.

TALLAROOK LATE FLOWERING SUBTERRANEAN CLOVER

T.K.— 1. Head, E. C. L., Seymour.

VICTORIAN IRRIGATION WHITE CLOVER

I.W.— 2. Hamley, H. J., Dingee.
3. Jackman, I., Dingee.
29. Hamley, W. H., Dingee.
37. Howe and Jackman, Dingee.
40. Ennals, E. R., Cobram.
41. Thomas, C. F., Tandarra.
42. O'Donnell Bros., Katandra West.
43. Cormican, R., Invergordon South.
44. Sinclair, J. and Son, Box 4, Lockington.
45. Hickey, P. N., Katandra West.
46. Mills, A. and Sons, Katandra South.
47. Black, W. J., Katandra West.
48. Cormican, A., Katandra West.
50. Boord, E. F., Tallygaroopna.
51. Coleman, N. J., Katandra West.
52. Williams, M., Katandra West.
53. Jeffers, R. E., Katandra, via Cosgrove.
54. Frankland, W., Katandra West.
56. Trevaskis and Ware, 114 Maude-street, Shepparton.

HORTICULTURAL NOTES

Jobs for March

Sow green manure crops of lupins, tick beans or peas in March.

Apply pre-harvest drop prevention sprays six to eight days before picking Jonathan apples.

Water young fruit trees during dry periods.

Time the picking of apples—follow carefully the chart which appeared in the January issue of this Journal.

Citrus trees may be sprayed or fumigated this month for scale control.

SPRAYS CAN PREVENT FRUIT DROP

ONE of the greatest problems confronting the orchardist after he has effectively controlled pests and diseases in his fruit crop is the dropping of fruit just before it matures. This problem is associated with all fruits, but is most severe in the early varieties of apples, pears, grapefruit, and plums.

As many growers have found to their great satisfaction, commercial preparations containing certain synthetic growth substances give excellent results in controlling this pre-harvest drop of apples, pears, and grapefuit, but there are still many who have not taken advantage of the development of these materials.

With apples and pears, the material responsible for the prevention of pre-harvest drop is alpha naphthalene acetic acid, which is only required in an extremely small concentration, ten parts per million, to effect the desired result. This concentration is given in the dilutions recommended by the manufacturers of the many commercial brands of the spray.

Since the material requires 24 to 48 hours to become effective by preventing the formation between the fruit stalk and the tree of the corky layer which is responsible for the fruit drop, the spray should be thoroughly applied about two days before the expected drop occurs, that is, five to seven days before harvesting. The effect of

Above.—A grapefruit tree sprayed with 2, 4-D.

Left.—An unsprayed tree.

In each instance one week's fall is represented.

the material will gradually disappear until, after about two to three weeks, it is no longer effective.

If, for some particular reason such as shortage of labour or small fruit size, the picking period should extend for more than the effective life of the spray, a further application may be made.

Care should be taken that any fruit sprayed or unsprayed, is not kept on the tree past its normal maturity period or its keeping quality will be reduced. The anti-drop spray may be combined with D.D.T. or lead arsenate sprays.

Winter drop of grapefruit, although not as imminent as the drop of apples and pears, can commence about May. The material alpha naphthalene acetic acid used for apples and pears was found to be of little value in controlling this drop, but one application of the substance 2, 4–D at a concentration of 22 parts per million, has given spectacular results.

While alpha naphthalene acetic acid on apples and pears has an effective life of about two weeks only, 2, 4–D on grapefruit is effective for a much longer period. The same spray can be used on navel oranges if needed.

Because 2, 4–D at higher concentrations can damage or kill trees, care should be taken to ensure that the correct dilution is used. Commercial preparations are labelled to give the correct strength, and these directions should be followed carefully. Distortion of growth may occur if 2, 4–D, even at the low concentration of 22 parts per million, is applied while the tree is actively growing. It should not be used, therefore, until autumn growth has ceased.

Experimental work is being conducted with both alpha naphthalene acetic acid and 2, 4–D on plums, but the results to date have not been conclusive. It appears that the time of application is of particular importance and the principal aims in the set of experiments this year are to find the maturity at which the spray is best applied and the relative effectiveness of the two materials.

[J. D. F. Black, B.Agr.Sc., Assistant Horticultural Instructor.]

HARVESTING AND STORING BROWN ONIONS

Maturity

The time for harvesting onions depends largely on seasonal conditions, but usually takes place from late December with the early strains of Globe and continues until early March with the late strains of Australian Brown, commonly called Brown Spanish by most growers.

Maturity is reached when the tops have yellowed off with approximately 20 to 25 per cent. of the tops fallen over. At this stage the skins cling more tightly to the bulbs, which will stand handling better without bruising and loss of skins. Many growers leave crops until practically all the tops are down, with the result that many bulbs become skinless, which considerably reduces their value, and also their storage life.

Skimming

Selection of a fine day when the ground is dry, is ideal for skimming operations. The roots are cut and bulbs lifted with a skimmer, an implement with two horizontal cutting blades fixed to a frame on which the blades can be adjusted to cut at various depths. The blades are usually set to a depth of 2 inches under the bulb and a sweep attached to the rear of the implement places the bulbs in rows after being lifted. The skimmer lifts from three to six rows each round and is drawn by horse or tractor.

Curing

Should weather conditions be normal, the bulbs are raked or harrowed until they are cured evenly and the tops completely dried out. A common hand hay-rake does this work well. Many growers in an effort to reduce the amount of labour and also to speed up the curing operation, run over the skimmed rows of onions with the harrows. However, this practice is not encouraged, as the bruising and splitting caused by the operation increases the losses during storage due to fungal rots. The curing usually takes from seven to 21 days according to weather conditions during this period.

Bagging

When bulbs are cured they are raked into rows, convenient for bagging. A fine dry day, when the tops are brittle and excess skins shed readily, is the best time for this vital operations.

The dry top is twisted off before the bulb is placed in the bag, and the bulbs are graded during this operation. Avoid pulling tops off as this may loosen and bruise the neck scales, causing the scales to shed moisture. This creates ideal conditions for the build up of the various diseases, particularly neck rot, one of the main causes of severe losses in stored onions.

A mechanical bagging machine with a sweep which guides the bulbs into a large wheel, is now being used. This elevates the bulbs to a chute where they roll down in view of the operators, who remove excess tops and rubbish before the onions go into the bags. The bagged onions are then stacked in a convenient place for sorting and grading before they are marketed or stored. All doubles, poorly-skinned or damaged onions are removed before marketing. This method enables growers to bag large quantities in a very short time, and is particularly valuable if wet weather is anticipated. During a normal season the greater percentage of Brown Globe onions is sent to the market direct from the paddock.

Storage

Stack onions for storage in a dry condition. Australian Brown can be stored safely for several months with the minimum of loss. These are stacked in bags on a stand made of logs raised 6 to 12 inches from the ground to allow good ventilation in the lower portion of the stack. Bags are usually stacked six tiers high, each tier containing fifteen bags, then tapered off with fifteen bags to form an inverted V. A roof of palings or iron is placed over the stack with an overhang of at least one foot over the outer edge of the stack to throw excess water clear of the lower tiers.

Ventilation

Arrange the stack to allow space between the bags to form a tunnel right through each tier. This should be arranged so that uniform ventilation may be obtained throughout the stack. Good ventilation is vital to the long and satisfactory storage of onions. Trim all weed growth around the stack regularly, as this impairs the air-flow underneath the stack. Main losses occur in the lower tiers of stacks, especially when the stack settles down, and the pressure on the lower tiers becomes evident. As pressure increases, ventilation is impaired, causing rot and premature growth (shots) in bulbs. This is most noticeable when onions have been stacked in a damp condition.

[J. R. D. Jones, Vegetable Supervisor.]

Free Film Screenings for Primary Producers

Film screenings will be given by the Victorian Department of Agriculture, free of charge, to primary producers' and other rural organizations on application to the Director, Department of Agriculture, Treasury Gardens, Melbourne, C.2.

The Department, which produces its own films and makes copies of important overseas agricultural films, displays them throughout Victoria by means of two well-equipped, mobile units.

Programmes may be chosen at the suggestion of the organization for which the screening will be given and to suit the district in which it takes place. A list of films will be posted on request.

The Film Section is one of the many educational extension activities of the Department of Agriculture which provides this service free to Victorian primary producers. All the local organization has to do is to provide a hall and attend to local publicity; the Department does the rest. If electric power is not available, the Department can provide a portable generator.

THE DAIRY FARM

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Effect of Feeding on Selection

IT is frequently stated that high-quality dairy cattle must be well fed in order to give full expression to their superiority, and this argument has been used in support of uneconomic feeding in some stud herds. On the other hand it has been argued that stud stock should be reared under conditions similar to those found on the farms which receive stock sold from that stud.

Some light has been thrown on the relative performance of dairy cattle fed at different levels by the use of identical twins. Identical twins are, in effect, duplicates of the same animal. Therefore, if the two animals in such a pair are subjected to different planes of feeding, any difference in their production could be ascribed to the environment.

Should this be done with several pairs of twins each having different inherited ability to produce, would the superiority of the top-producing twins under good feeding conditions be repeated by their twin mates at a lower level of feeding?

This test was made in New Zealand recently, where fifteen sets of twins were split up between three controlled levels of feeding and their production was recorded for three seasons. Almost without exception, on the three levels of feeding, the ranking order of production of the twins was the same. Thus, if cows A, B, and C were the top three cows respectively on high-level feeding, their twins A1, B1, and C1, would rank in the same order on a low plane of feeding. This indicates that, in general, within a herd, cows with a high inherited capacity to produce will excel over poorer quality cows regardless of the level of feeding.

Consequently, farmers selecting cattle bred under hard conditions with the intention of transferring them to a more favourable environment, or vice versa, can accept with confidence the relative performance of the stock under one set of conditions as a guide to their relative production on a different level of feeding. [T. N. EDEY.]

Prevention of Bacterial Contamination of Milk

Close observation and the use of the strip cup assist in early detection of diseased udders, and in the elimination of the first source of contamination. Milk from a healthy udder is almost sterile, but bacteria can enter through the teat orifice. It is wise, therefore, to discard the foremilk thus infected.

Bacteria, which are almost everywhere, may enter at any stage thereafter. Gross infection is less likely if milking is done in clean, well-constructed premises, with well-cleaned, impervious floors and sited in clean, dust-free surroundings. Concrete yards, approaches and exits lessen the tendency for dirt to accumulate. Exposure of bails and yards to sunlight arrests the development of bacteria and moulds about them.

Dairy premises should be in two distinct sections—one for milking and the other for milk treating, cleansing and storage of utensils. The latter section should be well ventilated and fly-proofed, capable of being

easily cleaned and free from all material which can harbour dirt and bacteria. Buckets and other utensils should be seamless, well tinned (or of stainless steel) and free from dents and sharp corners which are difficult to clean. It is good practice to use as few containers as possible when handling milk.

Hygienic Methods in the Dairy

The milker must observe personal cleanliness, especially of hands and clothing. He must be a healthy person who is not a carrier of a dangerous disease.

Care should be taken to prevent dirt, hairs, or flies from entering the milk, especially where hand-milking and hand-stripping are practised. A fine strainer will remove dirt which has entered milk, but the foreign particles, meanwhile, will have conveyed some bacteria to the milk.

Cleansing of machines and utensils involves, first and foremost, complete removal of all matter on which organisms can live, including "milk stone," followed by sterilization by heat treatment. A further worthwhile precaution is the flushing of machines with sodium hypochlorite (one tablespoonful per gallon) just prior to milking.

Some Bacteria Still Enter

Despite all precautions, it is not practicable to produce milk which is entirely sterile. Such bacteria as have entered will multiply at a much slower rate if the milk is promptly and effectively cooled, while prompt delivery to the processing factory without any exposure of the milk to the sun's heat will ensure that the least possible spoilage will occur.

Bacteria counts and methylene blue reductase tests conducted by the Department of Agriculture, and by milk depots, are a final safeguard designed to ensure that the causes of highly-infected milk will be quickly traced and remedied. [H. L. Foskey.]

Paddock Recording Made Easy

A number of farmers who took part in the 1952 Dairy Farm Management Competition—and doubtless others also—are keeping regular records of the amount of grazing obtained from each of their pasture paddocks. Not all of these records, however, were in a form which allowed a ready analysis to be made, and this is essential if full value is to be obtained from them.

One method which has some merit is the keeping of a separate note book for each paddock in which fertilizer applications, harrowing, topping and other treatments are also recorded. But perhaps the easiest way to record "cow grazing days" is to use a monthly chart similar to that formerly used under standard herd test to record cows' daily milk yields, using a column for each paddock and a line for each day or half-day.

Recording then becomes simply a matter of day to day entering, in the appropriate column, the number of stock grazing. The figures can be readily totalled at the end of the month and reduced to "cow grazing days per acre" for each paddock if the areas are known.

The interpretation of the results rests with the farmer, who knows all the modifying circumstances. Despite its limitations, paddock recording will sometimes disclose striking differences between two pastures which would otherwise appear equal in the eyes of the owner.

The Young Farmer

Science can rarely give a final and clear-cut answer to any farming problem. This statement may prove discouraging to those who hope, for example, that a soil analysis will point the way to a magical increase in production, or those who ask "What is a suitable ration for a dairy cow?" in the hope that some simple formula will replace all the careful planning needed to feed the herd properly throughout the year.

But, to those who know how to use it, science is a valuable aid to agriculture. Science consists, basically, of closely and accurately learning facts by observation, applying sound reasoning to those facts and arriving at correct conclusions from them.

This being so, every farmer must do some of his own scientific work if he is to attain the highest success. Plot trials may prove that this pasture mixture or that manurial treatment gives best results on the plots concerned. A farmer may justifiably hope that they will do equally well under similar conditions on his farm, but he should use his powers of observation to enable him to decide whether his hope has become a reality. If not, he would find it instructive to seek the reasons. Could there be differences in

soil type, direction of slope, moisture conditions, grazing management, or the previous history of the land which could account for the difference in results, or have other differences entered into his "experiment"?

Similarly, a farmer might ponder over a new and apparently successful method such as strip grazing, to see whether it would have a place in the pattern of his farm management.

When a new discovery comes to light, either from research or from farming experience, a farmer must ask himself, "Does this finding apply universally, or only under some restricted conditions? Has it any application to my farm and conditions?"

If it has, he might then ask, "What would happen if I were to apply this new knowledge on my farm?" This must be considered from many angles—equipment, finance, labour, climate, rate of stocking of the farm, maximum herd size which could be handled, and so on. If he then decides to apply the new method, he must then observe the results closely and finally ask, "How has it worked out on my farm?"

That is the way in which most intelligent farmers use the fruits of science. They can, of course, make one further contribution, by drawing the attention of the research workers to the problems which they have encountered and which still remain unsolved.

[K. M. Sillcock.]

The Garden Compost Heap

The modern method of composting or rotting organic material is to build it into heaps to promote fermentation by bacteria. The heaps are best constructed in layers 6 or 8 inches deep, each layer covered by an inch or so of animal manure, about $\frac{1}{2}$ inch of soil, and a sprinkling of lime.

Detailing the method of producing garden compost, Mr. George Hyam, Horticultural Supervisor of the Department of Agriculture, recommends building the heap, layer by layer, until it is 4 feet in height. Heaps may be built in units of approximately 4 ft. by 4 ft. by 4 ft., although the length of the heap could be extended if desired.

Build on the surface of the soil and do not pack the material down so hard as to prevent the entry of air which is necessary for the bacteria to do their work in decaying the material.

Vents made every foot or so by driving a stake down to the bottom of the heap and by rotating the stake to make holes about 4 inches in diameter permit the escape of gases which, if allowed to remain, retard the process of decay.

After a month of two, the heap is turned by reversing the layers, placing the top at the bottom, and sides in the centre. This second heap will be ready for use in about a month.

If the mass becomes too wet or too dry, fermentation and decay will cease.

The animal manure used between the layers is known as an activator. If none is available, a dressing of $\frac{1}{4}$ inch blood and bone or an inch of urinated earth (soil with urine poured over it) may be used instead. A slower, but not quite so good an activator, is a mixture of superphosphate and sulphate of ammonia (2 to 1) at the rate of a handful to each layer.

The finished compost is best applied to the soil as soon as it has reached a state of decay.

Garden Notes for March

By GEORGE HYAM, Horticultural Supervisor

THE FLOWER GARDEN

Delphiniums—The Premier Blue Flowers

WITH the possible exception of the dahlia and iris, no other garden flower has shown such rapid improvement in size and quality of the flowers as the modern hybrid perennial delphiniums, and it is pleasing to state that Australian raisers have made notable contributions to this advance.

The size of the individual florets and the length of the flower stems, which grow to over 6 feet under the best conditions, have been accompanied by the production of many more shades and tints which older delphinium specialists could scarcely imagine. This is not to say that some of the older belladonna and superbissima strains, which are less than half the size of the modern Pacific Giants, cannot still be planted to advantage in some mixed flower beds on account of their deeper blue colours.

The modern types are perhaps more suitable for the large garden if quantities are to be planted and their flower stems are somewhat large for interior decoration unless the florets are separated and arranged individually. If we include the annual "butterfly" delphiniums and the larkspurs, there is no other family of plants which will provide such an extraordinary range of blue and blue-shaded flowers, and in all types; there are also pinks, whites, and a few yellows, although these usually lack the stateliness of the blue varieties.

The whole family can be said to be hardy under our conditions and suitable for growing in all districts in season. All types respond to the same soil conditions which are primarily good drainage and a mildly acid soil with a pH of about 6·5 for choice. Another essential is a high organic content and good depth if perennial delphiniums are to be at their best.

The Perennial Delphiniums

For those gardeners commencing to grow delphiniums, it is best to start off with a few yearling crowns of a high-quality strain, though raising from seed and growing on the seedlings is the more economical and perhaps more interesting, due to the wide range of shades it is possible to obtain from one lot of seed, the pick of which can be propagated by cuttings or division, and thereby perpetuated. In regard to height and size of floret, seedlings come reasonably true to strain, but colour and arrangement of the florets on the flower stem will show some variation. A good strain of seed from a known source is well worth while even if the price is much higher than the ordinary packet seed. Perennial delphinium seed retains its germinating power for a short time only; seed over six months old is always doubtful. For this reason, March sowing, using seed collected from spring flowers, is more desirable than seed sown in spring.

An additional advantage is that the young plants will have formed a substantial root system by the spring planting time. They can be planted out after the frost period with the assurance that they will produce flowers from which their quality can be assessed by the end of the year. Pricked-out into seedling boxes with a spacing of about 2 inches each way will allow for this, though protection from frost is necessary during the winter, as delphinium seedlings are frost tender.

Yearling or older crowns can be purchased from May to August and planted during that period. Some prefer to start the yearlings or spring-sown seedlings in individual pots and plant in September, particularly in cold districts. For the home garden, a good method of propagation of a few selected plants is by cuttings. These are first side shoots produced by the previous year's crown which have not yet flowered, taken when they are about 4 inches long and struck in individual pots of light sandy soil. They are cut off with a slight heel of the old root-stock adhering. They root easily and quickly, and will produce the equivalent of a yearling crown in about two months and being pot-grown, they can be planted out in late spring for autumn flowering.

Delphinium crowns will produce flowers for about five years, but better flowers will be obtained if the crowns are renewed after the second flowering. The old crowns could be divided for replanting, seeing that each portion has from three to five buds. The writer does not altogether favour this method, as there is a danger of crown rot if the replants meet wet conditions soon after replanting.

Growing Delphiniums

Apart from the soil conditions suggested above, there are a few cultivation details that should receive attention. Delphiniums are gross feeders, and more so than any other garden flower, need a good supply of nitrogen, also abundant organic matter in the soil and as a mulch.

The base fertilizer and subsequent side-dressings given twice during the season are best applied in the form of a complete manure like "market gardener's" to which a little extra sulphate of ammonia has been added, say at the rate of one part to eight of the mixture, or else 2.2.1 superphosphate, ammonia and potash can be used, both at the rate of about half a matchboxful per matured crown or half that quantity for a seedling, spread in the form of a circular drill 2 inches deep around the plants but not in contact with them. When growth starts, and the first buds appear, water on a solution of 1 oz. of ammonia to the gallon, and repeat every third week during the flowering period. Due to the size of the modern delphinium flower spike, it pays to provide a light stake as support against possible wind damage unless the position is well sheltered.

Avoiding Delphinium Troubles

Delphiniums are very susceptible to attack by slugs and snails, and it wise to surround the plants with a snail bait in spring and autumn. An occasional spraying with D.D.T. will protect against insect pests which are mainly aphids and occasional chewing insects.

Root-rot is usually entirely due to overwet soil conditions, and the main disease is mildew which is usually the result of planting in too much shade, overcrowding—they need 3-foot spacing—or due to excessively humid weather. Mildew is not difficult to check using sulphur sprays or dusts, but the special mildew spray containing Shirlan AG is even more effective, as it is for rose and other mildews on flowers.

Picking Delphiniums

The correct stage at which to pick delphiniums for vases is when approximately one-quarter of the florets are open, and if this is done the life of the stem is prolonged. The stems should be cut well down towards the crown, preferably just above a new lateral shoot. Even if the flowers are left for garden display, they should be cut in this way before all the florets wither so as to encourage secondary flower stems to develop.

In early winter or after the last flower stem has finished, all growth should be cut back within about 6 inches of the crown, which can be left in the ground if the bed is well drained, but which is better lifted and heeled-in in some drier place if the bed is likely to become very wet in winter, or if it is necessary to dig over the bed at that time.

THE VEGETABLE GARDEN

Poultry Manure for Garden Use

Most gardeners realize that poultry manure is of considerable value in the home garden, and that large quantities are used by commercial growers too, but there seems to be some confusion as to how it can be best and most economically applied. Those who have their own fowls should also know the best way of collecting and storing poultry manure prior to use so that it does not deteriorate in manurial value.

Poultry manure contains more inorganic plant food than other animal manures due to its relative dryness even when fresh and its inorganic content also is higher. As for all kinds of animal manure, the actual content is variable according to the nature of the feed of the animal, though this is not of great significance in garden use. However, a great factor in such variation is the amount of bedding or scratching material, soil or any other foreign substance contained in the sample, whether the manure has been stored under cover, exposed to the weather, or allowed to become damp. These points are worth bearing in mind in relation to the price of any to be bought. Poultry manure collected from dropping boards or swept

from concrete floors without litter could easily be worth 25 per cent. more than other manure carelessly saved.

Poultry manure from backyard pens will have its maximum manurial value if it is collected frequently from dropping boards and floors, and then heaped on a concrete or brick floor under cover to dry out before bagging. Until it is used, it should never be allowed to become wet, otherwise its nitrogen and potash content is quickly leached out.

The following is a typical comparative analysis of fresh animal manures, and although the actual figures of different samples may vary, the comparative ratio of the different elements, apart from the moisture content, will remain fairly constant.

Manure.	Nitrogen.	Phos. Acid.	Potash.	Organic Matter.	Moisture.
	%	%	%	%	%
Cow ..	0·20	0·17	0·10	16	83·5
Horse ..	0·44	0·17	0·35	26	75·8
Sheep ..	0·55	0·15	0·15	34	64·0
Poultry ..	1·75	0·85	0·56	45	52·0

It will be seen that even in the fresh moist form, poultry manure has the highest organic and inorganic content and less useless moisture than the other kinds, and, therefore, weight for weight it is the most valuable, providing its content has not been reduced by leaching. In the ratio between the different elements it is somewhat low in phosphorus, and in actual practice it has been found that better results are obtained when some superphosphate has been added, usually at the rate of about 1½ lb. per bag or ½ lb. per kerosene tinful.

Backyard poultry raisers may be interested to know that each hen is estimated to produce about 56 lb. of manure per annum.

Applying Poultry Manure

It is best to first dry the manure and then to pulverise it by placing in a sack and beating this with a stick. This allows for a much better distribution for garden purposes if it is to be applied direct. But as for other animal manures, it is far more economical and effective if it is first composted with vegetable matter. Poultry manure, particularly when fresh, is the fastest accelerator for composting. There is no limit to the proportions which could be used in a heap when plenty is available, but an inch layer on an 8-inch layer of vegetable matter will make very good compost, and due to its high nitrogen content, much less poultry manure is necessary as an accelerator than other kinds of animal manure. Composting avoids any possibility of the so-called "burning" effect of fresh poultry manure, and in properly constructed heaps there is no loss of its content. Used without composting, the most economical method is to use it as a surface mulch, taking care that tender young plants are not buried in it. The next best method is to apply in drills alongside row crops or in circular drills round large plants like cabbages and tomatoes.

A kerosene tinful of uncomposted manure to 4 square yards can be considered a reasonable dressing for gross-feeding crops like cabbage; half that quantity will suffice for flowers and the smaller vegetables.

Poultry manure makes an excellent liquid manure by suspending a sugarbagful in a 40-gallon drum or a 5-inch flowerpotful in a kerosene tin of water, but this will be improved by the addition of some superphosphate as suggested above. The first infusion, after standing at least five or six days, can be diluted with equal parts of water before use. The vessels can be filled up again, allowed to stand for at least a week, and the solution is then used neat.

Some Useful March Plantings

Apart from the usual winter and early spring leaf vegetables, the planting of which extends from the end of January through this month, there is often space left by finishing summer crops which might be filled profitably in order to amplify the somewhat lean period which extends from late August until November. White onions sown in February and March are usable as green onions from September, and until they mature in November. Leek seedlings planted now will mature during this period, and if available, celery seedlings might still be planted to advantage, though they must be used, whatever their size, before the end of October. While it is too late to sow root crops other than turnips in the south, in northern areas they can still be sown, as there they will grow on steadily through the winter and are not so prone to run to seed in late September as those sown in the south.

(continued on page 90.)

Prevention of Sprouting in Stored Table Potatoes

By G. H. MATTINGLEY, Potato Expert and W. A. DOWNIE, B.Agr.Sc., Agricultural Research Officer

The use of chemical substances having plant growth regulating properties has assumed an increasing degree of economic importance in many aspects of agricultural production in recent years. The growth of many plants can now be stimulated, retarded or even prevented according to the objective desired. During the past 10 to 15 years, the effect of several of these hormone-like substances in preventing the growth of sprouts on stored table potatoes has received a great deal of attention. The Department of Agriculture has taken an active interest in these developments and, for several years, has conducted experiments with certain of these materials.

Spectacular Results Achieved

THE results obtained with these chemical substances have been spectacular and are of particular interest to those concerned with the preservation of potatoes over extended periods. It is now possible after chemical treatment, to maintain table potatoes in prime condition during that period of the year in which they normally undergo rapid deterioration.

This deterioration is due to the natural sprouting of the potato tubers, which commences at the end of the dormant period following maturity of the plant, and is responsible each year for the waste of many tons of potatoes from that part of the mid-season and late crops held until towards the end of the year, before marketing.

Cool storage has been resorted to, particularly in climates warmer than Victoria, but has proved unsatisfactory because, at the temperatures necessary to prevent potatoes from sprouting, physiological changes take place within the tubers making them sweet to the taste and unpalatable to most people. Further, the cost involved in holding a bulky commodity like potatoes in cool store is considerable.

Experimental work conducted with various sprout depressants showed that, under local conditions, they were by no means equally effective in controlling sprout growth. Some were weak in action and merely delayed emergence of sprouts, while others gave a peculiar result in that they were very effective on some varieties of potato, while on others they were practically useless.

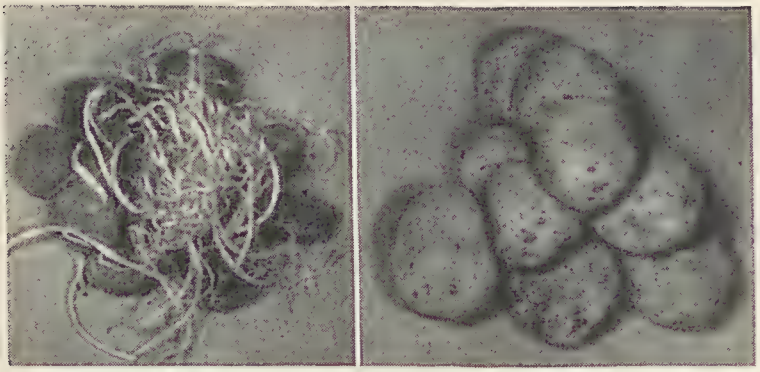
Completely satisfactory results were obtained with a dust containing 2·4 per cent. isopropyl phenyl carbamate. Potatoes of all the commercial varieties grown in Victoria have been treated with this material at the rate of 3 lb. per ton soon after harvest and then stored for six months in bags covered to exclude light. On being opened up in December the tubers were firm and fresh in appearance, had no sprouts whatsoever, and had lost at most only 10 per cent. of their original weight, mainly through transpiration. The cooking quality of these potatoes was good.

In contrast, untreated tubers stored under the same conditions were shrivelled and flabby and were poor in cooking quality. They had lost 23 per cent. of their original weight, nearly half of this loss being represented by the weight of sprouts 6 to 9 inches in length, which had been produced.

Anti-Sprout Dust Now Available

A dust* containing 2·4 per cent. isopropyl phenyl carbamate in an inert base is now available on the market at approximately 8s. per lb. The recommended rate of treatment is 3lb. per ton entailing a cost of 24s. per ton for materials only. The cost of application would vary considerably depending on the time and manner in which it was done. If treatment is carried out during the course of bagging the potatoes at harvest time, the cost may be as little as 15s. per ton, while a cost of approximately 45s. per ton may be incurred if treatment is made a separate operation. The total cost of treatment should not exceed 70/- per ton.

* "Tuberite," manufactured by Imperial Chemical Industries of Australia and New Zealand Ltd.



Left.—Untreated potatoes. Right.—Potatoes treated with I.P.P.C.
Both samples were stored for six months.

The Credit Side

On the credit side there are considerable savings to be made by treating potatoes with this material. Firstly, over a six months' storage period, a loss of 13 per cent. in weight is prevented, which alone is worth £3 8s. with potatoes valued at £30 per ton. Further, a labour cost estimated at £2 per ton in desprouting potatoes is obviated.

The use of dusts containing isopropyl phenyl carbamate provides new possibilities in the extension of the storage life of table potatoes. This treatment should be attractive to organizations such as the armed services, State institutions, construction camps and shipping companies, which are often faced with the need to store potatoes for several months without the deterioration incidental to sprouting. Should the need arise, potato marketing boards could utilize this material to facilitate the storage of surplus potatoes in glut periods and hold them to alleviate end of season shortages.

Home Gardeners Provided For

Finally, and by no means of least importance, the householder who grows his own or prefers to buy his potatoes by the bag, now has a relatively cheap and easy means of preserving his potatoes in good condition for at least six months after harvest. A special pack containing sufficient dust to treat one bag of potatoes and costing 5s. has been placed on the market for the home gardener.

THE VEGETABLE GARDEN—(*continued from page 88*)

To supplement and to provide a change from brassica leaf crops, a row of prickly spinach might well be planted now. The secret to successful growing of spinach is heavy manuring. The soil should be as rich in organics as for the brassica crops, and the same complete fertilizer should be used at planting time. Virus is the main trouble, but this can be kept down to a minimum by high fertility and the suppression of insects which can convey the disease by fortnightly dustings or sprayings with D.D.T. or the use of the combined D.D.T. and B.H.C. dusts when applying to the brassicas. If the spinach plants are given space to develop, say 10 to 12 inches apart, their leaves can be harvested individually like silver beet and thus prolong the use of the crop, instead of the usual commercial practice of gathering the whole plant from 6-inch spaced rows.

Kohl Rabi is another suitable crop for this season and it can either be sown direct or transplanted, and it will not run to seed until November. For quality, however, it is best used before then, starting when its bulbs or swollen stems reach about 3 inches in diameter. Space 6 inches apart in the first instance, thinning out and using alternate plants as they reach this size.

Growers north of the Divide can sow peas, and they can generally obtain a winter picking or two from March-sown broad beans. In the south, peas are somewhat of a gamble, but there March-sown broad beans will certainly produce pods from September onwards, if not before.

JAM MAKING AT HOME

Some Useful Hints and Recipes

By GWEN McCROREY, Fruit Preserving Expert

Pantry shelves well-lined with wholesome, richly-coloured jams and preserves, give infinite satisfaction to the good housewife—and to her family. Conserved when fruit is plentiful, these foods help considerably to keep the household budget within bounds. In the following article the Department's fruit preserving expert, Miss Gwen McCrorey, outlines jam-making methods suitable for use in the home, and supplies some well-tried recipes.

JAM is made by cooking fruit, sugar, and sometimes a little water, together until a jelly-like substance is obtained. This jellying point is reached only when the acid, water and pectin content of the mixture reaches the correct proportions.

A good jam should be clear, bright in colour, and have a fresh sparkling appearance. It should set well, but not too firmly. The jam should be pleasant to the palate and the flavour of the fruit from which it was made should predominate. With a little care, it is quite possible for the amateur to make jam of a high standard.

STEPS IN SUCCESSFUL JAM MAKING

The following procedure may be used successfully for most kinds of fruit.

1. Always use fresh, firm-ripe fruit free of decay; never over-ripe fruit. Over-mature fruit will not set, and loses flavour. Wash the fruit carefully, remove blemished parts, stems, and allow to drain free of water.

2. Prepare the fruit according to type. For instance, halve and stone plums and apricots; slice or dice quinces. Cut pieces of an even size. Weigh the prepared fruit.

3. Place fruit in a clean preserving pan and add a little water if necessary.

4. Heat gently and allow to simmer until the fruit is quite soft. Cover the pan with a lid as this will greatly reduce the time required for cooking.

5. When the fruit is soft, test for pectin and add the required amount of sugar. (See Pectin Test.)

6. Stir carefully until the sugar is thoroughly dissolved.

7. Bring slowly to the boil. Boil rapidly when sugar is completely dissolved, because fast boiling helps to retain colour. Long slow boiling destroys the natural colour and produces an unpleasant dark-coloured product. Strained lemon juice added to jam greatly improves its colour and flavour.

8. Boil the jam rapidly for twenty minutes.

9. Remove scum after fifteen minutes rapid boiling.

10. Test for setting (see below).

11. Heat bottles in the oven and place on a folded wet cloth.

12. When a good setting test is given, remove jam from fire and bottle immediately. Always bottle the jam hot in hot, dry, jars.

13. Seal while hot.

14. When they are cold, wash the jars thoroughly and store in a cool, dark, dry place.

The Pectin Test

The amount of pectin the fruit contains decides the amount of sugar required to give a good set. The pectin content decreases as the fruit increases in ripeness. Fruit rich in pectin will take more sugar, while fruit with a lower pectin content requires less sugar to obtain a firm jell. If the pectin content is low, as in apricots and peaches, it is not possible to obtain a firm jelly-like set.

Place fruit on to cook and allow to cook until soft and pulpy. Remove one teaspoon of the juice, place in a glass and allow to cool. Add two teaspoons of methylated spirits, stir and allow to stand for one minute. Examine the contents of the glass.

If the fruit is high in pectin the juice will form a firm single jelly-like clot, or a clot in two large pieces. In this case, an equal measure by volume of sugar may be added to the pulp. If the clot is in several large pieces indicating a lower pectin content, then three-quarters of a cup of sugar is used for each cup of liquid. If the clot is badly broken, a successful jelly-like jam cannot be made.

CONSERVE

Large pieces of fruit in a syrup or jelly constitute a conserve. This is in contrast to jam in which the fruit is reduced to a pulp. A satisfactory method of making jam which has qualities very like a conserve is to prepare the fruit and cover with half the weight of sugar. Allow to stand overnight. In the morning, cook slowly until the fruit is tender. Add remainder of the sugar and stir until dissolved. Bring to boil and boil rapidly until setting point is reached. Just before this point has been reached, remove scum. Bottle and seal while hot.

Tests for Setting

1. *Temperature Test.*

Use a fahrenheit thermometer, and when the temperature reaches 218 to 222 degrees, the jam is removed from the fire, as it will then be sufficiently cooked.

2. *The Flake Test.*

Dip the stirring rod or wooden spoon into the mixture, lift out and hold above pan for a minute to cool slightly, then turn on edge and allow jam to drop back into pan. If it flakes off rod in large, heavy flakes, then the jam is ready to scum and bottle.

3. *Cold Plate Test.*

Place a little jam on a cold plate, and allow to remain for a short time. If the surface of the jam wrinkles when pushed with a spoon, the jam will set.

Sealing the Jars

The three simplest methods of sealing are using :—

(*a*) Cellophane tops.

(*b*) Rings of brown paper pasted with flour paste containing alum or cayenne pepper.

(*c*) Melted paraffin wax. Pour a thin film over the surface of cold jam and seal with a cellophane or brown paper top or a screw lid.

If screw-top lids are used, always see that clean wads are placed in the lids each time they are used. If this is not done the jam is apt to acquire an unpleasant flavour.

Spoilage in Jams

The most common causes of spoilage in jams are moulds, fermentation, and crystallization.

Moulds thrive best in warm, moist places. Therefore, prevent them by—

1. Storing jams in a cool, dry place.
2. Putting jam into bottles which are thoroughly clean and dry.
3. Thoroughly cooking the jam to evaporate excess moisture.
4. Using fruit firm-ripe, not mushy. If jam develops mould, remove it together with one half-inch of the jam. The underlying jam may then be used quite safely.

Fermentation is caused by micro-organisms which develop because of insufficient sugar or insufficient cooking. If jam is only slightly fermented, it may be re-boiled with the addition of a little sugar.

Crystallization is due to the use of too large a proportion of sugar; overboiling; allowing the jam to boil before the sugar is thoroughly dissolved; or the use of too much sugar in jam which is allowed to stand overnight before it is completely cooked. The sugar forms a crust around portions of fruit which is not easily dissolved by cooking.

Recipes

PEACH AND PINEAPPLE JAM.

One large pineapple, 7 lb. peaches, 6 lb. sugar, 3 lemons, 1 pint water.

Prepare pineapple by either scraping or dicing. Peel peaches and cut into pieces. Place peaches, pineapple and water in pan. Bring slowly to the boil. Simmer for half an hour, or until the fruit is soft. Add heated sugar, stir until quite dissolved. Add lemon juice and boil rapidly until it sets.

FIG CONSERVE.

Six lb. figs, 4 lb. sugar, ¼ pint vinegar, ½ pint water, ¼ lb. preserved ginger, ¼ teaspoon cayenne, 1 teaspoon ground ginger.

Make a syrup with sugar, water, vinegar and flavouring. Add whole figs while syrup is boiling. Boil until figs reach the desired colour and syrup is thick. Bottle and seal while hot. Do not use for two weeks.

SATSUMA PLUM JAM.

Five lb. plums, 1 quart water, 4 lb. sugar.

Cut plums in half, remove stones, and place fruit and water in pan. Bring to the boil and boil rapidly until soft. Add sugar, stir until it is dissolved, bring to boil and boil rapidly for twenty minutes. Remove scum and, when

the jam falls in heavy flakes from stirring rod, remove it from stove. Bottle immediately in hot bottles and seal at once.

STRAWBERRY JAM.

To each 1 lb. of strawberries allow 1 lb. of sugar and juice of one lemon.

Wash strawberries carefully and remove hulls. Place in a bowl. Sprinkle with sugar and allow to stand in a warm place for several hours. Drain off the syrup, taking care not to bruise the fruit. Boil syrup for twenty minutes, add the fruit and boil very rapidly until setting test is given—usually about ten minutes. Remove scum.

Cool for five minutes before bottling to allow the fruit to become evenly distributed throughout jam.

RASPBERRY, LOGANBERRY, BOYSENBERRY JAM.

The above fruits may be used following this recipe. To each 1 lb. of berries allow 1 lb. sugar and the juice of half a lemon.

Place berries and sugar in a pan over slow heat. Stir the berries gently until all of the sugar has dissolved. Add strained lemon juice. Bring to the boil, and boil rapidly for twenty minutes. Five minutes before lifting from pan, remove scum. Bottle into hot jars and seal at once.

APRICOT JAM.

Six lb. prepared apricots, 1 pint water, juice of 2 lemons, 6 lb. sugar, some of the kernels.

Choose sound, firm-ripe apricots. Wash and cut in halves, keeping some of the kernels. Place kernels in saucepan, cover with cold water, bring to the boil, place again in cold water and remove the skins. Cut each in half and add to the fruit.

Place fruit, prepared kernels and water in pan, bring to boil and simmer until apricots are quite tender.

Add sugar and stir until it is quite dissolved. Bring to the boil and boil rapidly for 20 to 30 minutes. Remove scum and, when jam gives a good setting test, remove from fire. Bottle immediately into hot bottles and seal at once.

Fruits in Season

The following calendar shows when the main fruits for jam-making are in season:—

November—Strawberries, cherries, gooseberries.

December—Strawberries, loganberries, raspberries, apricots, cherries, gooseberries.

January—Apricots, plums, raspberries.

February–March—Plums, pears, apples, peaches, figs, jam melons, blackberries.

April–May—Quinces, jam melons, apples.

June–November—Citrus fruits.

Lead Arsenate Deposits on Apples and Pears

Because of the widespread use of D.D.T. in recent years, apple and pear growers have not been greatly troubled with the problem of excessive deposits of lead arsenate on harvested fruit. However, the continued use of arsenate of lead in the spray programme for the control of light-brown apple moth had, in some cases last season, resulted in a greater deposit of arsenic on fruit than was permitted under the regulations. This caused some trouble with fruit exported to the United Kingdom.

Export apples and pears this season will be subjected to a close examination for arsenical deposits. Growers, therefore, are warned against spray practices likely to result in an excessive arsenical residue on their fruit. The following advice, if carefully followed, should result in a much smaller residue:—

1. Do not apply more than the number of sprays recommended by district orchard supervisors for light-brown apple moth.
2. Recent investigations have shown that, if combination lead arsenate-DDT sprays are to be applied, lead arsenate may be used at this time of the year at half the usually recommended strength, i.e., $1\frac{1}{2}$ lb. powder or 3 lb. paste per 100 gallons of water.
3. Because white oil emulsion will make the lead arsenate adhere to the fruit and increase the residue problem, this emulsion should not be applied at this time of the year.

[Contributed by the Horticultural Division.]

TUBERCLE-FREE DAIRY HERDS

ACCREDITED TUBERCLE-FREE HERDS

The following dairy herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual, physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive, physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Breeds of Cattle comprising the below-mentioned herds are as follows:—

A.A., Aberdeen Angus; A.I.S., Australian Illawarra Shorthorn; Ayr., Ayrshire; D.Sh., Dairy Shorthorn; F., Friesians; G., Guernsey; J., Jersey; P.H., Poll Herefords; R.P., Red Poll; Sh., Shorthorn.

Name.	Address.	Breed.	Number in Herd.
Aboriginal Station	Lake Tyers	J.	152
Alberni Bros.	Ferntree Gully	Sh.	80
Ampt, E. W.	Gymbowen	Ayr.	7
Anderson, G. R., and Son	Toolern Vale	J.	57
Assumption College	Kilmore	F.	34
Atkinson Bros.	Swan Hill	D.Sh.	160
Atterby, H. A., and Son	Hamilton	J.	22
Ballarat Orphanage	Ballarat	J.	105
Beattie, W. P.	Katandra West	J.	57
Beer, W. G., and Sons	Nanneella	R.P.	108
Beggs, A. R.	Beaufort	R.P.	61
Bleakey Bros.	Horsham	D.Sh.	26
Bott, J.	Yarrawonga	A.A.	134
Bradbury, H. A.	Mooroopna	G.	42
Bruhn, C. H., and V. I.	Mirboo North	J.	68
Buchanan, J. M.	Flinders	Ayr.	69
Bunn, A. A.	Tatura	Ayr.	115
Burgman, F. A.	Katandra West	J.	108
Burley, H.	Mortlake	J.	48
Callahan, Philip	Barwon Downs	D.Sh.	66
Candler, G. E.	Coleraine Road Farm, Hamilton	F.	241
Carne, W. J.	Pakenham Upper	J.	42
Carson, M. E.	Irrewillipe East	J.	144
Cason, J. M.	Lima South	J.	73
Charles, R. C., and Sons	Glenburn	H.	91
Charlton, G. F.	Stoney Creek	J.	55
Chirnside, R. G.	Skipton	J.	74
Clark, R. W., and Son	Whittlesea	J.	87
Clark, W. J.	Monomeith	J.	103
Clarke, R. C. N.	Seymour	A.A.	139
Connell, J.	Gunbower	G.	72
Coorlemungle Prison Camp	Timboon	R.P.	41
Cother, A. E.	Binnum	F.	54
Cowan, G. L. S.	Bacchus Marsh	F.	54
Cox, F. G.	South Lyndhurst	J.	55
Cox G., and R.	Murraydale	J.	98
Cribbs, T. A.	Wangaratta	J.	50
Cunnington, R.	"Grantham," Bamawm	R.P.	74
Dark and Gibson	Woori Yallock	A.I.S.	61
Deering, J. T.	South Wangaratta	J.	97
De La Rue, N. C.	Tomahawk Creek	J.	57
Dennis, D. J. A.	Terang	A.A.	69
Dixon, Mrs. E.	Research	D.Sh.	63
Dookie College	Dookie	Ayr.	127
Dookie College	Dookie	P.H.	74
Dougall, J. K.	Hastings	J.	48
Drechsler, W. P.	Swan Hill	J.	65
Ducat, Mrs. F. W.	Ardmona	J.	47
Dunster, H. R.	Moyston	G.	31
Eagle, W. H.	Yarram	J.	59
Emmett, Mrs. S., and Sons	Stanhope	J.	69
Everist, F.	Tyabb	A.A., R.P.	29
Ewence Bros.	Warrnambool	F.	203
Fidler, F. W.	Werribee	F.J.	45
Finch, F. M.	Beaufort	D.Sh.	8
Fixter, A.	Boisdale	G.	26
Foletta, G. G., and Son	Buxton	Ayr.	188
Fyfe, Mrs. P. S.	Berwick	G.	5
Gilbert, J. A., and R. D.	Yinnar South	J.	110
Gleeson, P. J., and Son	Tynong	J.	155
Goddard, James H., and Sons	Cora Lynn	Ayr.	107
Gorman, A. W.	"Cathcart," Alexandra	Ayr.	94
Graves, L. J., and A. L.	Battery Park, Mansfield	A.A.	125
Griffiths, J. G.	Benalla	D.Sh.	114
Gross, Mrs. G. F.	Green Lake, via Horsham	J.	24
Hamilton, A.	Flinders	Ayr.	79
Harrison, B.	Hamilton	F.	45
Hartwick, J. P.	Hamilton	Ayr.	42
Haywood, Dr. A. R.	Hastings	J.	21
Hearn, Miss I. K.	Rochester	G.	92
Hicks, E. J., and Sons	Echuca	J.	106
Howell, G. G.	Wollert	P.H.	94
Howlett, E. and G.	Lang Lang	J.	117
Ivone, M., and Sons	Ovens	J.	143
Jackson, H.	Lockington	J.	77
Johnson, F. G.	Horsham	J.	51
Jones, A. C.	Barnawartha	A.I.S.	198
Jowett, Capt. A. C.	Clonbinane	R.P.	69
Keele, H. A.	Bamawm	J.	63
Kelynack, P. T.	Bundoora	J.	88
Kemelfield, J.	"Wongala," Woodend	Sh.	88
Kemp, E. J.	Horsham	Sh.	11
Kerr Bros.	Bacchus Marsh	Sh.	33
Klemm, H. F.	Londrigan	J.	84
La Fontaine, G.	Mitta Mitta	J.	63
Light, D. T.	Noradjuha	J.	10
Longerenong Agricultural College	Dooen	Ayr., P.H.	82
Lorimer, C. O.	Ocean Grove	R.P.	56
Ludeman, L. C.	Ayrford, via Timboon	J.	120
Luke, K. G.	Romsey	P.H.	79
Maloney, P. J.	Tongala	J.	77
Maybery, A. H.	Mitre	D.Sh.	14
Meaklim Bros.	Mooroopna North	D.Sh.	59
Middleton, H.	Lower Ferntree Gully	Sh.	23
Middleton, J. A.	Labertouche	F.	97
Millman, A. J., and Son	Colac	F.	111
Morton, R. S.	Heiton Vale Farm, Romsey	A.A.	16
Murphy, J. J.	"Glen Vale," Lang Lang	Ayr.	47
Myers, J.	Myrniong	D.Sh.	88
McCallum, W. J., and Sons	Tatura	J.	86
McCormack, M., and Sons	Mansfield	R.P.	127
McIlroy, B.	Edi	J.	138
McIntosh, J.	Merrigum	R.P.	85
McKenzie, E.	Wandella, via Kerang	J.	75
McKenzie, Mrs. E. J.	Woodford	J.	65
Mackenzie, H. P.	Trawalla	J.	33
McMillan, W.	North Mooroopna	G.	62
McNabb, G. A., and Son	Irrewillipe East	J.	145
McPherson, A. L., and J. J.	Kyneton	D.Sh.	98
Nancarrow, E. J.	Kerang	J.	28
Newton, J. M., and Sons	Whoroully	A.I.S.	101
Newton, J., and W.	Tarrawingie	J.	81
Nicholas, M. A.	Sherbrooke	J.	77
Nicholson, Mrs. L. E.	Banyule Stud, Yarra Glen	J.	142
Noonan, Mrs. S. A.	Benalla	J.	50
Norris and Nevett	Dixon's Creek	J., G.	77
Northcote Children's Farm	Bacchus Marsh	J., Sh.	85

TUBERCLE-FREE DAIRY HERDS—*continued*

Name.	Address.	Breed.	Number in Herd.
Palmer, E. H., and N. B.	"Dalvui," Terang	J.	204
Payne, A. E. T.	"Yarra View," Lilydale	G.	89
Payne, T. E. N.	"Woodburn," Kilmore	R.P.	77
Pelchen, E., and F.	Moutajup	Ayr.	16
Perry, W. C., and L.	Buxton	Ayr.	43
Potter, W. J.	Longwarry North	F.	136
Prosser, J. E.	Ondit	J.	42
Ralph, J.	Binnum	D.Sh.	142
Read, I. D., executors of estate	Springhurst	J.	94
Richardson, W. S.	Bayswater	J.	13
Ritchie, R. B., and Son Pty. Ltd.	Penshurst	J.	144
Rix, A. A.	Officer	J.	66
Robinson, T. W.	"The Ranch," Warracknabeal	J.	34
Rutherglen Research Station	Rutherglen	J.F.	71
School of Horticulture	Burnley	J.	4
Scott, A. L.	"Wolonga," Kongwak	J.	55
Selwyn-Scott, F. E.	Scotsburn	D.Sh.	77
Sewell, Estate of Sir Sydney	Berwick	G.	72
Shanahan, G.	Myrniong	D.Sh.	126
Smith, L. J.	Lower Norton	R.P., J.	4
Smith, R. A.	Bundoora	F.	80
Speirs, A. E., and Sons	Nalangil	Ayr.	62
State Research Farm	Werribee	R.P., F.	291
Stephens, Dr. F.	Vermont	G.	32
Stokes, R. N.	Millgrove	D.Sh.	72
Taylor, J. M.	Mooroopna	Sh.	28
Thompson, H. D. L.	Merricks	J.	59
Till, J. A.	Tongala	J.	59
Tucker, E. G.	Horsham	D.Sh.	29
Walker, C., and Son	Macedon	J.	45
Ware, J. G., and Sons	Lower Gellibrand	G.	32
Warnock J. A.	Lima South	J.	142
Waterhouse, J. H.	Pakenham	J.	88
Watson, R. G.	Frankston	G.	38
White, F.	Warrenbayne	J.	42
White, J. E. B.	"Challicum," Buangor	J.	18
William's Victoree Farms	Dalmore	A.A.	54
Williamson Bros.	Carisbrook	Sh.	162
Wilson, Alan	Tongala	J.	47
Wilson, J. C.	Gnotuk	A.A.	109
Wilson, J. L.	Koo-wee-rup	A.I.S.	105
Woodyer, P. A.	Bittern	J.	22
Woori Park Pty. Ltd.	Pakenham	G.	67
Young, N.	Whittlesea	J.	86

In addition to the above, the following is a list of herds in their respective districts which have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the Accreditation Scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

District.	Herds.	Cattle.
Ararat	9	254
Bairnsdale	7	441
Ballarat	81	2,770
Benalla	7	128
Bendigo	62	2,876
Berwick	41	1,461
Broadmeadows	93	3,737
Buln Buln	1	130
Colac	5	187
Cranbourne	12	538
Creswick	4	95
Doncaster	15	625
Eltham	5	329
Geelong	111	4,535
Hamilton	11	499
Heidelberg	39	869
Heytesbury	2	113
Horsham	13	552
Kerang	3	101
Mornington Peninsula	131	3,576
Morwell	4	505
Portland	18	680
Rutherglen	16	413
Sale	10	674
Stawell	8	253
Swan Hill	4	195
Terang	2	73
Wangaratta	5	305
Warragul	60	3,189
Warrnambool	8	260
Whittlesea	194	7,696
Wonthaggi	12	732
Woorayl Shire	21	1,342
Yarragon	31	1,696
Yea	34	72

There are also 1,451 herds, in which 63,160 head of cattle have passed one test and may be considered, therefore, to be in process of becoming tubercle-free herds.

The Australian Society of Animal Production

Victorian Branch Formed

The Australian Society of Animal Production recently formed a Victorian branch of the Society. Similar branches have been formed in New South Wales and Queensland and will eventually be linked to form a federated organization of the type existing in Great Britain, New Zealand, and the United States of America.

The scope of the Society will embrace all matters relating to the technique of animal production by promoting and encouraging the interchange of ideas in the field of animal science throughout the Commonwealth and overseas countries. To that purpose the Victorian branch is holding periodical meetings where lectures are given on subjects of animal production by Australian and overseas research workers and leading producers.

Membership is open to persons engaged upon some research, technical or commercial aspects of animal production.

The following lectures were held in Melbourne last year:—

Professor C. W. Turner—Endocrinology in Animal Production.

Dr. D. E. Tribe—The Importance of Animal Behaviour in Animal Production.

Miss I. J. Stewart—Current Poultry Research at the State Research Farm, Werribee.

Mr. W. A. Beattie—The Complementary Use of Sheep and Beef Cattle in Southern Australia.

Professor F. F. McKenzie—Beef Cattle Production Testing.

The next address will be given by Mr. F. Skaller, Officer in Charge, C.S.I.R.O. Poultry Research Centre, Werribee, on "Inbreeding and Outbreeding." This lecture will be given on Friday, February 27, 1953, 8 p.m., at the School of Agriculture, University of Melbourne.

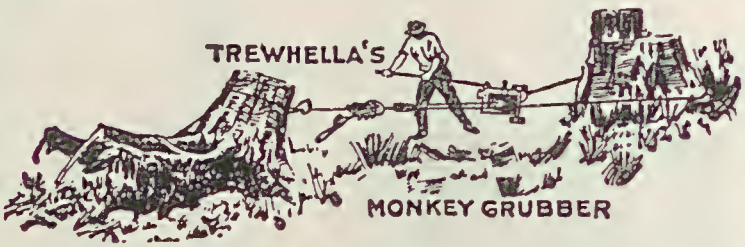
Further lectures planned during the early part of 1953 are:—

Dr. R. Watson—An Inquiry into the Most Suitable Time of Mating Wool-producing Breeds of Sheep in Victoria.

Mr. K. M. Sillcock—Survey Work in Conjunction with Herd Recording.

Mr. W. B. Miller—Fat-lamb Production Investigations.

Guests are welcome, but it would be appreciated if those who wish to attend Mr Skaller's lecture or to receive invitations for following lectures would send their name and address to the Honorary Secretary, Australian Society of Animal Production (Victorian Branch), c/o. C.S.I.R.O., Poultry Research Centre, Werribee, Victoria.



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VICTORIA

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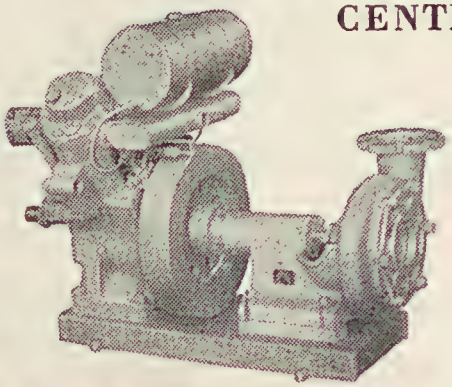

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SSB 4 in.	220-500	80
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SSB 6 in.	600-1200	80
SSB 8 in.	800-1800	80
SSB 10 in.	1500-3000	80
SSC 1 in.	0-40	140
SSC 1½ in.	30-100	140
SSC 2 in.	80-170	140
SSC 3 in.	150-300	140
SSC 4 in.	280-550	140
SSD 1½ in.	0-70	200
SSD 2 in.	60-140	200
SSD 2½ in.	100-180	200
SSD 3 in.	140-300	200
SSD 4 in.	250-500	200

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DAIRY FARM MANAGEMENT

Results of 1952 Competition

By K. M. SILLCOCK, B.Ag.Sc., Senior Dairy Husbandry Officer

Mr. A. Beach, of Girgarre, grazes lucerne off lightly, using the electric fence.

In its final year the Dairy Farm Management Competition, which was conducted for four years conjointly by the Victorian Herd Improvement Association and the Department of Agriculture, again brought into prominence some interesting features of dairy farm management and some individual farmers who have achieved a high degree of proficiency in this complex task. This year, a new contest, to be known as the Dairy Production Improvement Competition, will take the place of the earlier competition, and is expected to highlight the methods of dairy farmers who are doing most to increase their production of butterfat.

THE competition last year attracted fewer entries than former dairy farm management contests, but this was not surprising, as it is in the nature of all such competitions that the number of interested people decreases after a few years. There was, however, no falling off in the interest taken by some farmers who continued to enter each year regardless of their placings in previous contests, knowing that, in each of them, there would be something to learn.

Not least to benefit were the officers of the Department of Agriculture, who acted as judges. To meet leading farmers and to make a detailed survey of their management methods was an experience of the greatest interest and value. It is confidently expected that the new competition will confer similar benefits on both farmers and judges.

Good control of grazing is an important part of the programme of Mr. F. A. Reiter, winner of the State Championship, for the development of his farm at Berry's Creek.

FEATURES OF THE COMPETITION

Steady development continued on farms which were entered in previous years, mainly in the direction of improving farm layout and fodder storage, developing better pasture control, and evolving better methods of farm record keeping. There was evidence of increasing interest in the use of the electric fence for the strip grazing of pastures and crops while, in suitable climates, numbers of farmers were saving autumn pasture growth for later feeding to cows calving towards the end of winter. There was a growing interest in "H1" rye grass as a component of such pastures.

Most noteworthy feature of the year's dairying was the widespread interest in silage making, brought about by the development of new and easier methods of handling the material, and intensified by the wet season which threatened to play havoc with hay-making plans.

In some districts last season, even silage making was delayed, as paddocks were too wet to carry a tractor, and normal methods of pasture and grazing management were abandoned or modified owing to these unusual conditions. As far as possible, due allowance was made for the special difficulties faced by some competitors.

In 1952, as in previous years, it was noticed that those who reached the higher placings, far from feeling that they had approached perfection, realized that they had a great deal more to do to reach the standards they had set for themselves. The successful farmer must aim high, but should not be too discouraged if the attainment of his goals takes some years longer than at first anticipated.

SOLDIER SETTLER WINS STATE CHAMPIONSHIP

Highest award for 1952 went to Mr. F. A. Reiter, of Berry's Creek, a member and former president of Leongatha Herd Testing Association.

The story of Mr. Reiter's success begins in a military hospital, where he turned adversity to good use by reading and studying all the writings he could find on modern methods of dairy farming. The knowledge thus gained, added to pre-war experience, fitted this farmer well for the task which confronted him when, in 1946, he took possession of his present 124-acre holding which was then in a "run-down" condition.

The greater part of the property is on a hill slope with some very steep faces on the sides of gullies, but otherwise mostly negotiable by a tractor with its wheels set widely apart. A small area of flat below the main road gives Mr. Reiter access to a creek from which the main farm water supply is pumped.

Planning a farm on such hilly terrain presents problems not encountered on level country; nevertheless, layout of the seventeen paddocks allows for reasonably easy working. More remains to be done to bring this farm to the highest level in the section. "Farm Planning and Care of Equipment," but the remaining tasks are in the nature of refinements, such as improvements to gateways and provision of more shade and shelter, which tend to come later in the process of farm development.

It is chiefly by his efforts to develop highly productive pastures and to use them to best advantage that Mr. Reiter gained his lead over other competitors.

★

A Gippsland farmer mowing pasture for conservation as silage.

★

★

The excellent yield was due to a prolific early spring growth of "short rotation" rye grass.

★

★

Above and Right: Making a wedge-shaped stack of silage, using a tractor fitted with a rear buck-rake.

★

Good Feed at all Seasons

Western District perennial rye grass and white clover are the basis of the pasture mixtures sown on this farm. Strawberry clover and red clover were added to provide some green picking in the dry conditions which can occur about February in this district. The prolific growth of red clover seen recently as an aftermath on a paddock cut for silage justified the inclusion of this species. Mr. Reiter's continued wide reading gave him early knowledge of the possibilities of "H1" or "New Zealand short-rotation rye grass", and thereafter he included it in all pasture mixtures to provide winter and early spring feed.

In the past season, when continued wet weather necessitated lavish feeding of hay to the herd and reduced stocks to an unusually low level, Mr. Reiter stated that "H1" saved the situation. It came away very strongly during a fortnight of fine weather early in August and provided grazing of a quality needed by newly-calved cows.

The pasture establishment programme was accompanied by annual topdressing with superphosphate at the rate of 2 cwt. per acre, and vigorous, dense swards resulted.

Grazing Management

Pastures containing "special purpose" species require careful management if they are to give of their best. For several seasons the portable electric fence has been used on this farm to give finer control of the pastures by grazing.

When the writer first visited the property early in 1951, crude experimental equipment was in use. Baling wire was threaded through insulators attached to wooden stakes which were hammered into the ground. Each time the fence was moved, the fencer unit and battery also had to be carried to the new line. But increasing production figures convinced the owner that even this laborious procedure was worthwhile, and strip grazing was practised over the greater part of the year. Six months later, the work had been made much simpler. A generator was installed at the dairy and driven by the milking-machine engine to keep batteries charged. The fencer unit, also at the dairy, was connected, as desired, to two lines of telephone wire, one serving the northern and the other the southern part of the farm. These were connected to permanent insulated lines attached to alternate fixed fences. Any paddock could be strip grazed by attaching a portable wire to one of these fixed lines.

Reels had been imported and posts of ⅜-in. reinforcing iron had been made with curled tops to carry rubber tubing as insulators. Using this more convenient equipment, Mr. Reiter demonstrated during a later field day on his farm, that a 5-chain length of this portable fence could be moved, set up on a line 1 chain from its original position, and connected to the fixed line in about five minutes.

Pasture Control by Fodder Conservation

Mr. Reiter early realized that full value could be obtained from strip grazing only if he had the means to harvest surplus growth which could not be grazed or, alternatively, if more stock could be carried in times of plenty.

On occasions he has used bullocks to control the extra growth, but he has attacked the problem mainly through hay and silage making. His earlier equipment for silage making consisted of a tractor-trailer, a hay loader which took the material direct from the swathe and a grab stacker, but he has kept abreast of new developments and now uses the rear-mounted buckrake to make silage in trenches and wedge stacks, the latter being well suited to the sloping sites available to him in almost every paddock.

As the season advances in this district, silage making must give place to conservation of surplus feed as hay. Since the end of the season on which the competition was based, a pick-up baler has been added to the farm equipment for this purpose. Mr. Reiter's total investment in harvesting machinery must now be considerable, but it does emphasize the importance which he attaches to this phase of the work, and it might well be justified in view of the rapid increase which has taken place in his farm output despite the fact that he has ceased to buy any feed from outside sources.

Autumn Saved Pasture

In the absence of fresh green feed, newly-calved cows will not give of their best even when fed ample hay or silage. On the other hand, if calving is timed to coincide with the flush of spring growth, the cows

are apt to have short lactations and to slump badly in their level of production when pastures dry off in summer. Mr. Reiter aims to solve this problem by closing up some of his pastures after the first autumn rains and allowing them to grow through the winter. They are strip grazed by the early-calved cows to ensure that they are used to best advantage and are not wasted by soiling and trampling.

As the stock are thus confined to a smaller portion of the farm in autumn and winter, the conservation of ample fodder is an essential part of the autumn-saving programme, as hay and silage have to be fed out more liberally and for a longer period than would otherwise be necessary.

There is some doubt as to whether autumn saving would be possible in that district each season where ordinary pasture mixtures are sown, but the inclusion of "H1" rye grass, a good winter grower, has given Mr. Reiter much greater assurance that his cows will have highly palatable and nutritious feed to graze early in their lactations.

Steady Increase in Production

Mr. Reiter's methods won for him the section prize for "Land Management", and the justice of this award was confirmed by the steady progress made in the productivity of the farm. From the 33 cows which completed lactations during 1946–47, the herd has now increased to 61 milking cows, of which 54 completed lactations during 1951–52, and this increase in farm carrying capacity has been accompanied by a rise in herd-average production of 74 lb. butterfat per cow over the six completed testing seasons. From 75 lb. per acre in the first season, the farm production has increased in each successive year, and output is now more than double the original figure, despite the fact that feed is not now purchased.

While better feeding over a longer season may have helped to raise the yield per cow, the testing, breeding, and culling programme has also played its part, and much thought and care has gone into the selection of herd sires.

As in the field, so also in the dairy, Mr. Reiter has kept abreast of modern developments, and has adopted, as others have done, a smoothly efficient milking routine. The dairy premises are of simple and orthodox design and well maintained. Visitors are, at first, surprised by the sight of two deep holes outside the dairy; but these are not ruts of neglect; they were put there by design and are drained by pipes. They accommodate the trailer wheels so

In the photograph, below, the herd is grazing a fresh strip of pasture.

Mr. F. A. Reiter, of Berry's Creek, uses the electric fence to strip-graze his pastures (above). Note absence of long, waste patches of growth on the area already grazed.

that cans of milk can be loaded without heavy lifting. Such an arrangement would be possible, of course, only on a hillside.

Some of the credit for the winning of the State's premier dairying award was due to Mrs. Reiter, whose help, especially during her husband's times of illness, meant much to the success of this farming venture.

THE RESERVE CHAMPIONSHIP

The State Reserve Champions, Messrs. R. H. and L. J. Trease, are already well known in Victorian dairying circles, and large numbers of farmers have visited their farm at Dumbalk North.

Since these brothers won the State Championship in 1950 they have acquired a second farm in the district. They still remain partners, but Mr. Ron Trease manages the original property, while Mr. Lynton Trease resides on and manages the new farm. Not only did this divide their labour force, since augmented by paid helpers, but it also meant that part of the herd was transferred to the new farm, thus leaving the 159-acre home farm stocked to less than its capacity. Sixty cows were milked on this farm in the past season, whereas 80 were milked there in the season in which the championship was won by these brothers.

Reduction of stock numbers on a well-developed farm introduces difficulties in pasture management, and it is a tribute to the Trease brothers that they have been able to fill second place in the competition even in the face of their added difficulties.

These competitors also received the section prize for "Herd Management". The breeding programme, based for many years on herd testing and the careful selection of herd sires, evolved an outstanding herd of "production purebreds", that is, cows which are themselves high producers and have also demonstrated their ability to transmit this desirable quality to their progeny. Longevity is also a feature in this herd, which contains many cows in the "One-ton Butterfat" Register.

Mer Vue Leo, bought as the son of a proven bull and himself since proven of high quality in a sire survey, is still the main herd sire, and many of his daughters are now in the milking herd.

Economical Production

The inherent productive ability of a herd has a big bearing on the economy of butterfat production and, as this large herd is able to attain an average production in excess of 400 lb. with very little supplementary feed from sources outside the farm, it is not surprising to find that the cost per lb. of butterfat produced on this farm was one of the lowest in the competition.

Although the Trease brothers are part owners of a pick-up baler and have usually been able to have on hand a good supply of high-quality hay, they have moved with the times and have also made silage with the buck-rake in the past harvest season. This was dictated, in part, by the unusually wet season but, if the past season's experiments were successful, silage making may become a permanent part of the programme on this farm.

THE WINNING ZONE

The Commonwealth Fertilizers and Chemicals Ltd. challenge shield was won this year by Zone 9, comprising herd-test units in that portion of South Gippsland eastward of Leongatha. For the first time in this competition both the State champion and the Reserve champion entries have been members of the winning zone team of four. Their farms and management methods have already been described.

Third in the team was Mr. C. Stockdale, whose farm of 139 acres is situated near Leongatha. Full advantage was taken of the gently sloping nature of the terrain to plan a very effective farm layout based on intersecting lanes which give separate access to each paddock.

The lanes are well maintained and the plantations of pines which flank them provide excellent shade and shelter in many of the paddocks, as well as enhancing the attractiveness of the farm. A problem exists in the form of a swampy area at the lower end of the farm which cannot be drained, and this reduces the effective farm area.

The tendency for this country to dry out rapidly in summer has induced Mr. Stockdale to grow many crops for supplementary fodder—notably oats and rape. Good use is also made of lucerne. This programme of cultivation enables him to renew pastures if these are weakened by dry summers.

The farmstead is neat and tidy, and good methods are used in the simple but adequate dairy, which is kept in good condition. Mr. Stockdale scored well in the sections "Farm Planning and Care of Equipment" and "Methods in the Dairy".

Mr. George Trease, of Dumbalk North, was the fourth member of the winning team, and also shared with Mrs. B. McIlroy and Sons, of Zone 1, the section prize for "Farm Planning and Care of Equipment". Much of his 150-acre farm slopes steeply on either side from a central ridge on which the farm buildings are situated, but even the steepest land carries good pastures, the result of liberal topdressing and good pasture management.

The herd which grazes these pastures is being mated to bulls supplied from the outstanding herd of this competitor's brothers. The calves reared this year looked exceptionally well, and this indicated the value which is placed on such worth-while progeny and the care that is given to their rearing. But the herd has not yet reached its ultimate possibilities, either in size or in average production of its members, and great things can be expected from this farm in the future.

Aesthetic values are included in Mr. Trease's farm development plans. The many trees which have been planted will add beauty to the home and surroundings as well as provide shade and shelter, while the garden surrounding the home has been extended and improved each year, and far surpassed any others seen in the competition.

The other farm buildings are capacious, well-constructed, and maintained in first-class condition. On this steep farm, many problems of layout and water supply have been faced and overcome, and further developments are still in hand.

LEADERS IN OTHER ZONES

Zone 7 (East Gippsland)

Zone 7, which held the challenge shield in 1949 and won it again in 1951, once more put forward some strong competitors. They were led by Mr. M. Noble, of Boisdale, who milked 71 cows and carried all herd replacements on his 120-acre farm. Most of Mr. Noble's land is irrigated, but a smaller area not commanded by the supply channel is sown to Wimmera rye grass and subterranean clover which provide good winter feed. The main part of the farm is sown to perennial pastures, but some lucerne is also grown.

Placed third for the State, Mr. Noble uses many of the farming techniques described in the account of the State champion. Under irrigation, there is a place for strip grazing, he finds, over a great part of the

This view of Messrs. R. and L. Trease's property at Dumbalk North is familiar to many dairy farmers who have visited the farm as a result of its prominence in dairy farm management competitions.

A wedge-shaped stack of silage on the farm of Mr. L. M. Johnson, Neerim South.

season, although the farm is already well sub-divided, with separate access to paddocks from lanes which are maintained in good condition by use of a grader board.

Decentralized hay storage is a feature which, although arising from the location of the former farm home and buildings, nevertheless has much to commend it in these days when so many aim to feed the hay out in the paddocks from which it was harvested. Though baled hay is the main fodder reserve, the advent of the buck-rake has given silage making a place on Mr. Noble's farm.

The farm output of 182 lb. butterfat per acre (on the basis of factory returns) could be taken as equivalent to some 170-lb. per acre of actual production from the pastures, as some hay was bought in. This figure is among the highest seen in the 1952 competition.

Mr. Noble has a simple but effective system of farm record keeping, and cost analyses can readily be made. Another feature is the recording of grazing of each paddock and of other pasture-management operations.

This competitor's enthusiasm for paddock recording is shared by Mr. L. F. Nuttall, of Yinnar, who was placed second in this zone. Mr. Nuttall is also experimenting with newer farming techniques. He has not yet decided exactly what part strip grazing can play in his farm management, but it is likely to have at least one special application in dry years for the rationing of pastures on the river flats which can be irrigated.

For many years, Mr. Nuttall has made silage in pits, using a forward-mounted tractor sweep, but he is now among those who have adopted the rear-mounted buck-rake.

Of special interest is a double-ended silage clamp which he built between specially-designed metal walls. This was not a complete success, as the walls tended to lift owing to the fact that their props were too short and, therefore, stood at an angle too nearly vertical. Mr. Nuttall believes that, with longer props set at a lower angle, these walled clamps would be more successful.

He was ranked second in the State for the section, "Herd Management". Over the years, this farmer has built up a highly-productive herd, and, in the past season, his 45-cow herd had an average production of 461 lb. butterfat. While this represents an output of some 270 lb. butterfat for each of the 76 acres of the farm, it was done with the aid of a large amount of purchased concentrate feed. But, if we deduct the production of the number of cows which this concentrate would supply with all energy requirements, we can still credit the farm itself with production at the rate of some 170 lb. butterfat per acre.

The owner claims that it pays to buy feed for a herd of such high standard, and this argument is borne out by the fact that his cost per lb. of butterfat compares favorably with that on many efficiently-conducted farms where little or no feed is bought.

Mr. Nuttall is exceedingly thorough in his methods of selecting herd sires. Not only does he examine production figures minutely, he also visits the farms where bulls were bred and records made so that the figures can be assessed at their true value.

Messrs. Noble and Nuttall and Mr. W. Vagg, the fourth member of this team, all toured New Zealand with a party of dairy farmers in the autumn of 1952, and this experience has stimulated them to even greater efforts on their own farms.

(continued on page 136)

MORNINGTON PENINSULA PASTURE COMPETITION

Report of the Judge, S. C. POWELL, B.Agr.Sc., Agrostological Research Officer

Entries in the 1952 pasture competition conducted by the Mornington Peninsula Agricultural Society were judged on November 10 and 11. Pastures generally in the district were backward because of cold wet conditions during the greater part of the spring, some approaching the flowering stage without having made very much leaf growth, particularly where the soils had been waterlogged for long periods.

Most of the swards entered in the competition, however, were of a high standard. On better-class country, or where soil fertility had been built up and attention given to drainage, good late-spring feed and heavy hay crops were expected.

To maintain stock in healthy condition shelter belts are essential.

THERE were thirteen entries in the competition, and these were judged on their general appearance and uniformity, denseness and quality, botanical composition, absence of weeds and management. The plots varied in size from three to ten acres.

Some farmers made the mistake of entering newly-sown pastures which had not thickened up sufficiently to enable them to compete with swards established for several years. A fair comparison cannot be made unless all plots entered in a permanent pasture competition have been established for at least two years.

The pastures were judged on their condition at the time of inspection and, as the actual carrying capacity was not taken into account, all farmers, whether on good or second rate country, had an equal opportunity of scoring high points. Those on poorer soils, of course, had experienced much more difficulty in establishing and maintaining a dense weed-free pasture of high quality.

Location of Competition Entries

The entries, which were located at Mornington, Tyabb, Hastings, Bittern, Merricks, Balnarring, Flinders and Dromana,

covered a wide range of soil types. Some were on fairly flat country, but most were on rising ground or hillsides. Those on the flats appeared to have suffered most from the exceptionally wet season, but waterlogging caused deterioration even on some of the sloping ground, particularly where there was a hard-pan close to the surface or a sticky clay sub-soil.

PASTURE IMPROVEMENT

Roughly-cleared country or native pastures can be improved to some extent simply by scattering subterranean clover seed on the surface of the ground and topdressing with superphosphate, but if the surface soil is not scarified or broken in some way a big percentage of the seed will fail to strike.

For best results when sowing a grass-clover seeds mixture, the area should be cultivated and worked down to a firm clean seedbed. Pre-cropping is a wise practice as this helps to reduce weed competition to a minimum. On cultivated areas, the seed may be sown with or without a cover crop. In Victoria autumn and early spring are the usual times for sowing pasture species, autumn being preferred if conditions are favourable.

For the establishment of permanent pastures, the most productive and persistent species that will grow in the area should be selected, and only seed of high quality should be purchased. Newly-sown pastures must not be grazed heavily during the first season, and, in the succeeding years, regular dressings of superphosphate are necessary to maintain the productivity of the sward.

A well-balanced sward of persistent grasses and clovers, properly managed and adequately fertilized, should remain productive for ten years or more.

PERMANENT PASTURES ON THE MORNINGTON PENINSULA

The rainfall throughout the greater part of the Mornington Peninsula normally exceeds 30 inches per annum and, being fairly uniformly distributed over the year, is adequate for the maintenance of high-producing perennial species such as perennial rye grass, cocksfoot, and white clover. These species, together with subterranean clover, which is an annual, form the basis of the best pastures in the district.

White Clover

White clover will not hold on the lighter hill country unless the soil fertility has first been built up by subterranean clover or the soil structure is such that its summer moisture content does not fall below a critical level.

On the richer soils, and on low-lying country, white clover should always be included in a permanent pasture mixture.

Perennial Rye Grass

Perennial rye grass is regarded as the most satisfactory permanent pasture grass for sowing in the medium to high rainfall areas of Victoria. For maximum development, it requires moist, fertile soils and, where conditions favour its growth, produces a large bulk of nutritious leafy herbage. Its normal growing period under natural rainfall conditions in southern Victoria is from March to the end of November. It will not persist, however, on loose, dry soils.

A weedy, open pasture, as illustrated above, provides very little feed for stock.

Cocksfoot

Cocksfoot is a deeper-rooted grass which produces abundant feed during late spring and, under favourable conditions, will provide green feed right

A dense pasture of grasses and clovers.

through the summer. It will persist better than perennial rye grass on the loose, drier soils, but makes poorer winter growth. During the late spring, cocksfoot should be kept moderately well grazed, or it will tend to coarseness. It is a useful grass for hay purposes.

Phalaris Tuberosa

Phalaris tuberosa is another high-producing perennial grass which, although not sown to the same extent as perennial rye grass and cocksfoot in the medium to high rainfall areas of Victoria, is becoming popular in some areas because of its greater drought-resisting qualities, its adaptation to a wide range of soil types, and its ability to persist under conditions considered too wet for rye grass. It is, however, difficult to establish. In the early stages, *Phalaris* is unable to compete with vigorously growing species and, for this reason, should be sown alone or with a little subterranean clover seed only, on a well-prepared seedbed.

Once it becomes firmly established, it can make strong vigorous growth and must be kept well grazed or it may become rank and unpalatable, particularly if it gets away from the stock during the late spring. For very wet areas, a closely-allied species, *Phalaris arundinacea* (Reed Canary grass) is recommended.

Paspalum Dilatatum

Paspalum dilatatum, although generally considered to be of second-rate fodder value, makes a valuable contribution to some of the pastures on the Peninsula. It is a summer grower and, in moist situations, it must be heavily grazed by stock during its period of maximum productivity or it will tend to dominate the other species present and become sod-bound. It is somewhat difficult to eradicate once it has gained a strong hold, and is therefore not recommended for sowing in areas which might be required later for cultivation.

Italian Rye Grass

Italian rye grass, which is a biennial, is often included in sowing mixtures for early feed and to serve as a cover crop for the slower establishing perennial species. It normally tends to thin out after the first season. The New Zealand short-rotation rye grass, which is a cross between perennial and Italian rye grass will, under favourable conditions, persist for several seasons provided it can withstand the competition of perennial rye grass and other species sown.

Red and Alsike Clovers

Red clover or cowgrass and alsike clover are often included in permanent pasture sowing mixtures. These usually persist for a few years only, but are valuable because they provide early feed. Cowgrass in association with cocksfoot grows well in hilly country in the high rainfall areas and is occasionally combined with Italian rye grass to form a large bulk of high-quality hay. The late-flowering New Zealand Montgomery red clover, however, is recommended for permanent pasture mixtures. Alsike clover can be established on areas too wet for red clover.

Strawberry Clover

Strawberry clover is a useful summer-growing perennial species for wet low-lying areas, and is fairly tolerant of salty or alkaline conditions.

Volunteer Clovers and Grasses

Volunteer clovers such as suckling clover and cluster clover and volunteer grasses, notably Yorkshire fog, hair grass and winter grass (*Poa annua*) may be found growing in association with the sown species in most of the improved pastures on the Mornington Peninsula but, provided they are not permitted to dominate the sward, their presence is not serious. Should they take possession, the area may have to be ploughed and resown. The dominance of fog grass in some of the wetter areas of the Peninsula is causing concern to some farmers.

There is no easy solution to this problem, as the normal seasonal conditions in the area favour the development of this grass.

Phalaris tuberosa is a strongly-growing perennial suitable for areas on the Peninsula which are unfavourable for the development of perennial rye grass.

Yorkshire fog grass tends to dominate a sward if grazing is not controlled, or if the area is closed up for hay too frequently.

Topping to prevent seeding combined with hard grazing and the application of heavy dressings of superphosphate to encourage clovers and the better grasses should, however, check the development of fog grass. Allowing the pasture to run to seed favours Yorkshire fog, and paddocks dominated by this grass should be grazed heavily during late spring and not closed up for hay.

Weed Species

Rib grass, flat weed, capeweed, toadrush and sorrel are the main weed species found in pastures in this area, but they are not a serious problem, provided adequate precautions are taken to prevent their spread.

Most of the weed species found in pastures can be kept in check by adequate topdressing and controlled grazing to encourage the development of the sown species. The presence of sorrel is often taken to indicate acidity, but this is not always so. If the soil is proved to be definitely acidic, a heavy dressing of lime should be applied.

Where satisfactory responses to superphosphate are not obtained, it is advisable to have a sample of the soil tested for acidity or to try a strip of lime across a "supered" area and observe the results before liming on a large scale. The "strip test" is the best guide, as some soils with only a slightly acid reaction respond to liming.

Animal Manure

Most of the farmers in the district appreciate the value of animal manure and take steps to ensure that none is wasted. A large proportion of the plant potash taken

up by the animal when grazing or feeding on hay is returned to the soil in the droppings.

The scattering of droppings by the occasional use of grass harrows is a wise practice as this prevents the development of rank unpalatable patches of growth in the vicinity of dung pats. Hay should always be fed out in the paddock from which it was cut. The liquid manure is rich in potash and should not be wasted.

On dairy farms there is always a tendency for the paddocks near the milking sheds to become built up in fertility to an excessive degree at the expense of the outlying fields.

Rotational grazing, combined with regular topdressing and occasional harrowing and topping of the pastures, is an important factor in the maintenance of a high-producing well-balanced sward of grasses and clovers.

During the spring flush, a pasture made up of about 60 per cent. grass and the balance of clover, will provide a balanced diet for stock. The grass-clover ratio fluctuates from month to month and season to season, but can be kept fairly constant by good management. Close grazing favours the clovers and lenient grazing or closing up of the field favours the grasses.

COMPETITION AWARDS

Mr. W. Benston Awarded First Prize

In the Mornington Peninsula competition, there was little to choose between the leading entries, all of which were dense productive pastures of high quality.

First place was awarded to Mr. W. Benston of Flinders, whose plot consisted mainly of perennial rye grass and white clover with some subterranean clover, red clover and cocksfoot. The pasture was only two years old and had not yet completely dominated weeds and inferior native species, but nevertheless was considered to be the best entry because of the high percentage of productive perennials in the sward. No lime had been applied to this plot, but superphosphate had been applied each autumn at the rate of 1½ bags to the acre.

Second Place to Mr. H. Brockhoff

Mr. H. Brockhoff of Dromana gained second place with a well-balanced sward of perennial rye grass and clovers. Few weeds were found in this pasture, but points were lost because of the high percentage of volunteer suckling clover present. Suckling clover is an annual of limited pasture value.

A fair amount of subterranean clover was present in the sward, but very little white clover. Regular dressings of superphosphate had been applied to this plot to maintain it in a productive condition.

Mr. C. C. Johnson in Third Place

Third place was awarded to Mr. C. C. Johnson of Flinders. On this plot, which had been closed for hay, there was a dense sward of perennial rye grass, Yorkshire fog grass and subterranean clover with some white clover. High points were gained for the general appearance and uniformity of the sward and the absence of weeds, and only the presence of fog grass prevented it from being regarded as a first-class pasture. Superphosphate had been applied each year at the rate of one bag per acre.

LIST OF AWARDS—MORNINGTON PENINSULA PASTURE COMPETITION, 1952.

Entrant.	Appearance and Uniformity.	Denseness and Quality.	Botanical Composition.	Absence of Weeds.	Management.	Total.
Maximum Points	20	20	20	20	20	100
W. Benston, Flinders	19	19	19	16	19	92
H. Brockhoff, Dromana	19	17	17	18	19	90
C. C. Johnson, Flinders	19	17	16	18	19	89
C. W. Donne, Dromana	19	17	16	16	19	87
J. P. Raws, Merricks	18	17	16	18	18	87
H. Everist, Hastings	18	16	17	17	18	86
C. S. Mann, Merricks	18	17	16	16	18	85
R. Jones, Mornington	18	16	16	16	18	84
S. W. Ramsay, Balnarring	18	17	16	15	18	84
J. Coles, Mornington	17	15	14	14	18	78
Gouldthorp and Lucas, Tyabb	18	15	14	12	18	77
W. A. MacLaughlin, Bittern	17	15	13	14	18	77
C. A. Duncan, Dromana	18	10	15	15	18	76

LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

FARM WATER SUPPLY

THE importance of having an abundant supply of clean drinking water continuously available to all farm animals cannot be over-emphasised. The fact that water is generally very cheap and abundant possibly accounts for the casual attention it sometimes receives. As a horse requires about 10 gallons daily, a dairy cow about 15 gallons, pigs and sheep about 1½ gallons each, and poultry about 6 gallons per 100 hens, a large amount of water is required for the farm live stock. If the local supply fails, water carting can be most expensive.

An ideal supply for the farm live stock is one obtained from a running stream, spring, bore, town supply, or dam, laid on to all paddocks, pens, and yards through a pipe system to troughs for cattle, sheep, and horses, or automatic waterers for pigs and poultry. The storage should be fenced off from the stock to prevent them churning up the mud and putrefying the water, and should be large enough to carry through the driest seasons.

In proportion to their size, milking cows require a large amount of water. This is mainly because milk contains 87½ per cent. of water. Any shortage in the supply is reflected by a drop in milk yields. A milking cow may drink from 5 gallons to 40 gallons of water daily, the quantity depending upon her size, the amount of milk she is giving, the temperature and humidity of the atmosphere, and the amount of moisture in the food. Variations in the water requirements of other animals also occur.

Dry stock may thrive for months in cool weather on succulent pasture, grazed while wet with dew, without actually drinking any additional water. But when there is a water shortage, the feed usually is dry and there are practically no dews. When fed large quantities of skim milk, whey, or buttermilk, pigs may receive sufficient moisture in the feed. However, even under these special circumstances, it is advisable to have clear drinking water continuously available.

Dairy stock usually drink several times during the day and, for this reason, water should be available to them at all times. The water and the feed should always be situated close together and, in times of drought, the stock should be given all supplementary feed in close proximity to water. This avoids the loss of energy expended in travelling between the feed and the water.

Generally, stock should be allowed to drink as much water as they desire. With working horses, however, it is advisable that they be watered before being fed.

Water is used by farm animals for numerous functions. The body of the animal is more than half water. The blood and all other fluids and secretions in the body contain 80 to 90 per cent. of water. Water is necessary to soften and moisten the food for its passage through the alimentary canal. Digestion takes place only when moisture is present, and in it the digested food is dissolved and absorbed into the blood stream. Water is used to convey all the materials required by the body from one organ to another, and in it all the waste products are dissolved before being excreted.

Water is used also to regulate body temperature through the physiological function of perspiration or sweating. Food is eaten to develop heat, and water is evaporated from the lungs and pores of the skin to prevent the heat rising above a certain temperature, ranging between 98°F. and 104°F., according to the species.

Pure Supply Necessary

The purity of the water supply is of importance, since water may contain parasitic larvae, disease germs, organic matter, or excess minerals. Running water and water from springs, bores and large fenced dams is usually free of parastic larvae, disease germs, and excess organic matter, but may contain too much mineral. Water containing up to 400 parts of mineral salts per 100,000 parts is usually quite safe for drinking purposes, although for heavy milking cows the water should not contain more than about 200 parts per 100,000.

Stagnant water often contains many parasitic larvae, disease germs, and much harmful organic matter. When such water has to be used, lime should be thrown into the dam or waterhole to precipitate most of the organic matter and cleanse the water. At the first opportunity, the dam or waterhole should be cleaned out. If possible, when cleaning out a dam, it is advisable to remove all silt and leave bare clay exposed all over the sides and bottom. Vegetation usually takes a long time to grow on a bare clay surface.

Dams and waterholes are usually contaminated with parasites when stock have free access to them. Animals become re-infested with these parasites when they drink the water and graze the weeds growing around the edges. In the control of parasitic diseases it is essential that all dams and waterholes be fenced off from the stock, which should be watered from troughs. Parasitic diseases are particularly prevalent among sheep and young cattle.

Where it is not possible to gravitate the water to the drinking troughs, a windmill or engine and pump are required.

All troughs and automatic waterers should be regularly cleaned to maintain the purity of the drinking supply.

The minimum amount of water required for washing the cows' udders, the dairy utensils and milking machines, the dairy, cowshed, drains and yards for an average-sized herd of 30 to 40 cows, is about 2½ gallons per cow or 200 gallons per day. It is essential to have a pure water supply for washing the dairy utensils, and clean rain water, stored in galvanized iron or underground tanks, may be needed.

The amount of water used each day during the summer, on a dairy farm where 40 cows are milked, will be approximately as follows:

	gallons
Drinking water for 40 milking cows	800
Water for washing and cleansing	200
Drinking water for dry stock, calves, pigs, poultry, &c. ..	250
Total per day ...	1,250

If the water supply is pumped by windmills, tanks storing 10,000 gallons should be provided, as periods of eight days without wind to drive the windmills are not uncommon. Where electric motors or oil engines are used to pump the water, the storage capacity of the tanks should be sufficient to supply water over the longest periods that the machinery is likely to be out of order. Additional storage will be necessary for household and garden requirements.

Where dam water for stock purposes is depended upon for all, or portion, of the year, storages with a capacity of at least 1,000 cubic yards are essential on a 40-cow farm. In fact, in a district with a 30-inch rainfall, provision should be made for storing sufficient water for at least six months, whereas, in a district with a 20-inch rainfall, a twelve months' supply would be required.

[A.C.T.H.]

PIG CROP REPORT

The third half-yearly Pig Crop Report issued by the Bureau of Agricultural Economics shows that 14 per cent. less pigs were weaned in Australia in the second half of 1952 than in the same period a year earlier. In Victoria the decrease exceeded 21 per cent.

The report forecasts a slight drop in the autumn pig crop for Australia in 1953 from that of the autumn of 1952. In Victoria that drop is largest and is estimated to be about 17 per cent.

Total production of pig meat in Australia for 1952–53 is now estimated at 74,500 tons, which is a decrease of 9 per cent. on production for 1951–52. In 1944–45 production was 127,005 tons.

The Australian pig population is now the lowest since 1929. Only in Queensland and New South Wales are there indications of immediate future increases in pig production.

Probably the overall reason for the decline is the relative prosperity of the major farming enterprises to which pig raising in Australia generally has been a sideline business.

[L. A. Downey, H.D.A., Pig Expert.]

FALSE MOULT IN PULLETS

March is usually a precarious month for early-hatched pullets, as moulting is fairly general, with a marked drop in egg production. Some birds experience a partial moult, but most break into a full moult.

Birds are nervous and timid during the moult. They are bullied and driven away from food and water by those still in production, and spend most of their time on the perches. This tends to prolong the moult and keep the birds out of production for a longer period.

Segregation Desirable

Recovery would be hastened if the birds in the moult were separated from those still in production and placed in separate pens. The fighting would cease, food consumption increase, and the birds in the moult would have a chance of recovering more quickly. However, this isolation of moulting birds is not always possible on large commercial farms, owing to pressure of work, and consequently they are left together to fight it out and recover as best they can.

Moult Lighter in Later Hatched Pullets

The moult is heavier among July and August-hatched pullets than those hatched in September, although there is a percentage of birds affected in all hatches. Seasonal conditions seem to influence the extent of the moult, as it varies each year, but the incidence amongst pullets is fairly general each year. Feeding and management has little bearing on the trouble, as it occurs on the best of farms.

Early and late-hatched pullets lay approximately the same number of eggs during their first year of production. Those hatched in July usually lay well during January, February, and March, moult or cease laying for approximately two months, beginning again in June, and continuing until February the following year—a period of twelve months actual production.

Pullets hatched in September are laying in March and continue until February of the following year, a period of twelve months production, but poultry farmers usually become impatient with early-hatched pullets because they are moulting when the others are laying.

It will be seen from the above that the early-hatched pullets have to be fed for an additional two months while they are in the moult during their first year.

The application of electric lights helps to control the moult, but it is considered bad practice to expose young birds intended for breeding to artificial lights.

It may be possible to reduce the extent of the moult by providing a regular supply of fresh, tender green feed, or a good quality vitaminized oil or cod liver oil. The birds should have at least four square feet of floor space in the pens or a little more if possible.

There should be ample nesting and perching space provided, as lack of accommodation leads to fighting and dissension and may cause the birds to moult.

[M. D. Hall, Poultry Expert.]

BEEKEEPING

The present honey season has been one of the poorest on record. The Red Gum in the Western and Central districts yielded only about 60-lb. per colony compared with a normal flow of 150-lb. The wet weather in

(continued on page 116.)

The Cockchafer Beetle and Grub

REPORTS SOUGHT FROM FARMERS

The cockchafer dung beetle, *Aphodius howitti*, usually flies in the period, late January–early February. It is about $\frac{3}{8}$–inch long and about $\frac{1}{8}$–inch broad, and is dark-brown to black in colour. The beetles swarm on warm, humid nights and are attracted to lights in large numbers. Any animal droppings in the neighbourhood of an infestation are almost pulverized by them. If heavy infestations occur, the larvae, which hatch in two to three weeks, damage improved pastures during autumn and winter.

Farmers in whose districts beetle flights have occurred and grubs are showing up, are asked to report them to the Biology Branch, Department of Agriculture, Burnley Gardens, Burnley, E.1, which is investigating the problem. If obtainable, specimens for identification should be included.

Left—Cockchafer beetles (*Aphodius howitti*). Right—The larvae.

CERTIFIED PULLORUM-TESTED POULTRY FLOCKS

A certified Pullorum-tested Flock is one in which all stock over six months of age have given a negative reaction to the agglutination test for Pullorum Disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector, but it is not necessarily a guarantee of the type of birds in the flock.

The under-mentioned flocks have been certified by the Department of Agriculture, and will remain so for the current calendar year, or until such time as the Chief Veterinary Inspector determines.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Particulars of breeds of birds tested are as shown hereunder:—

A. Australorp; B. White Leghorn; C. Rhode Island Red; D. Sussex; E. Langshan; F. Brown Leghorn; G. Buff Orpington; H. Black Leghorn; I. Minorca; K. Legbar; L. Turkeys; M. New Hampshire; N. Plymouth Rock; O. Indian Game; P. Ancona.

Owner.	Breed.	Number of Birds.
Hoffman, C. W., 5 Pearl-st., Horsham	C	517
McQueen, R. J., Spring-road, Highett	C	517
Ridge and Son, Myrtle-grove, Blackburn	B, C, D	3,527
Waiting, T., Scoresby-road, Boronia ..	A, B	1,299

THE DAIRY FARM

Well-placed trees and shelter belts have improved the appearance of this property and provide adequate shelter for stock.

Shade and Shelter for the Dairy Herd

Many dairy farmers no doubt noticed during the past season that the herd's milk yield dropped on days of extreme heat and also when the weather was cold or wet. There is a reason for these sudden falls in production. When a cow is exposed to high temperatures, and cold or wet weather, she feels uncomfortable, and eats less than usual. In consequence, her production falls.

It may well be asked, what can be done to modify these extremes of weather and maintain herd production at a higher level. The answer is to provide adequate trees and shelter hedges. Now is the time to plan the planting programme. The best time to plant practically every species is in early winter, when there is usually sufficient warmth and moisture in the ground to give a good "strike".

Contrary to general belief, a shelter-belt does not merely have a beneficial effect in its immediate vicinity; it gives stock considerable protection from winds for a distance on its leeward side equal to twenty times its height. Species which grow close to ground level are the most suitable for shelter-belts because the stock sheltering close to them are not exposed to draughts.

In selecting the site for a wind-break it must, to be most effective, give stock protection against the prevailing wind. In southern Victoria, for example, the winds are predominantly from the south-west. Suitably placed T-shaped plantations can provide protection for stock in more than one paddock.

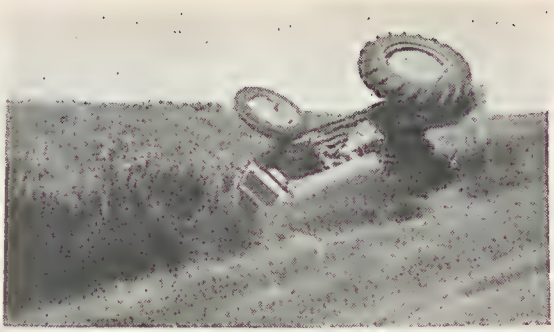
The species chosen will depend on the particular locality and purpose for which the trees are required. To obtain satisfactory results, all plantings must be well protected from stock and rabbits. Even where a tree or a belt of trees is fenced on all sides, insufficient space is sometimes allowed between the tree and the fence for the future outward growth of the lower branches. In such cases, as soon as the lower limbs reach the protecting fences, stock destroy them and the trees become bare and draughty at the base.

The Forests Commission of Victoria offers farmers advice on the selection and planting of species and has a wide range of tree and hedge plants available at a reasonable cost.

[K. FLYNN.]

New Silage can be Slippery

The accompanying photograph received from a reader of the Journal is a warning to all who drive tractors on to silage stacks or clamps. In this instance, the completed clamp was being rolled and the tractor was about 2 feet from the edge. When it was put into reverse, the wheel in the centre of the stack skidded, causing the tractor to slide sideways. At this stage, the driver believed he could steer it away from the edge, but, fortunately, took the precaution to dismount and walk beside the tractor. Total damage in this instance was the loss of battery acid and a few pints of oil, but it could have been much more serious if the operator had been less cautious.



Care is necessary when using a tractor to roll silage. In this instance slippery silage caused skidding.

Dairy Breed Characteristics

The table summarizes the statistics for milk and butterfat yield and butterfat test of cows recorded under Victorian Standard Herd Test during the past fifteen years. The estimated average live weight of cows of each of the seven breeds is also given.

Breed.	Number of Records.	Milk.	Test.	Butter-fat.	Live Weight.
		lb.	%	lb.	lb.
Jersey ..	34,967	6,291	5·5	346	850
Guernsey ..	1,903	6,538	5·2	340	950
Red Poll ..	1,984	7,262	4·2	305	1,000
Ayrshire ..	4,457	6,488	4·3	279	1,100
A.I.S. ..	1,512	7,025	4·0	281	1,150
Dairy Shorthorn ..	2,724	7,868	3·8	299	1,200
Friesian ..	1,984	9,971	3·5	349	1,250

[T. N. EDEY.]

Notes for the Young Farmer

You will have noticed that those competitors in the Dairy Farm Management Competition who have highly productive herds usually take considerable pains over the selection of herd sires, and attempt to make full use of any superior bulls they are fortunate enough to obtain. Some general rules for sire selection are laid down from time to time. For instance, farmers are advised to get a good progeny-tested or "proven" bull or, failing that, the son of a proven bull or one with a sound family history in production. But there are many details which the farmer himself must decide, since general advice does not fully cover all cases.

Imagine that your neighbour, a newcomer with no previous dairying experience, comes to you asking advice as to how to select his next herd sire. What would you advise? Should he go far afield, or can he get an equally suitable bull near at hand? You know the circumstances under which local herd test records are made, and it is easy to visit local farms and see the conditions under which the cows produce. Does this outweigh any advantages which more famous studs in other areas might offer?

If local studs have a high reputation, on what is it based—test performance, show awards, or merely because it carries on the names of famous but distantly related foundation stock? Do stock from these studs do well in local herds, and do the owners get repeat orders for bulls from local farmers?

What visible features would you advise him to look for in any bull under offer? Would you insist on fineness of "type", or would you merely look for signs of soundness and good health?

Under what circumstances could a commercial farmer with advantage breed his own bulls rather than secure them from elsewhere?

These and many other questions are faced by the commercial dairy farmer about to obtain a new herd sire, and he himself must supply most of the answers, since others do not know all the circumstances.

[K. M. SILLCOCK.]

ASSOCIATION TEST ANNUAL REPORT

In the 1952 Association Test Annual Report, the herd of Mr. K. McLean, of Leongatha No. 2, was inadvertently omitted from the list of leading herds. This herd of 41 cows, which averaged 471 lb. butterfat, led the herds of 40–59 cows, and was also the leading herd in the State. This herd has had an excellent record since 1945, showing an increase both in number of cows and level of production, as illustrated in the accompanying table.

In addition, the 70-cow herd of Mr. J. McGown (Yarram No. 1), which averaged 362 lb. butterfat, was omitted from the list of herds of 60–79 cows, in which it gained second placing. The 62-cow herd of Mr. H. W. Holmes, of Traralgon No. 4, was in sixth position in the same class with an average of 349 lb. butterfat.

Year.	Number of Cows.	Average Milk Yield.	Average Butterfat Yield.
		lb.	lb.
1945–46	23	6,474	351
1946–47	27	7,602	414
1947–48	24	7,545	427
1948–49	21	8,078	447
1949–50	40	8,761	510
1950–51	43	8,016	457
1951–52	41	8,115	471

BEEKEEPING—(continued from page 112).

the spring reduced the Yellow Gum flow to almost nothing. Swarming in some districts was extremely heavy on the very light flow.

The Angular Mallee bloomed fairly well in many places, but the bloom failed to secrete much nectar. The Messmate is flowering freely in parts of the Central districts, but up to the present it is yielding very little honey.

The autumn prospects are exceedingly lean, and movement of bees is taking place from all quarters.

Coastal tea-tree seems to be the only source of nectar at present. It is yielding profusely in many places, and the sample of honey is reasonably good.

Clover in the coastal area of the Western district was retarded by the cool weather, and only during mid-summer was honey available from it.

Manna Gum, Apple Tree and, in some places, Mountain Grey Gum, are well budded, but it is difficult to forecast how the honey secretion will be when they bloom.

New Apiary Inspector

Mr. A. M. Frost, who recently commenced duties with the Department as an apiary inspector, will be stationed at Euroa and advise beekeepers in the northern portion of the State east of the line connecting Swan Hill, Bendigo, and Kilmore on beekeeping problems.

Mr. Frost, who has had wide experience in the industry, was a partner in Messrs. Frost and Sons' apiary, and has had experience with the Producers' (Co-operative) Distributing Society, Ltd., both in Melbourne and Luton, England, and with American beekeepers.

[W. A. COLLINS, Senior Apiary Inspector.]

The Goulburn Valley is one of the largest fruitgrowing areas in Australia, producing approximately two-thirds of the Commonwealth's output of canned peaches, more than four-fifths of the canned pears, and nearly half of the canned apricots. In addition, it produces the bulk of Victoria's crop of tomatoes for processing.

The types of fruit trees and the conditions under which they are grown are fairly uniform throughout this area. Conditions are very different from those obtaining in other parts of Victoria and fruit growers throughout the area benefit considerably from the work carried out at the Department of Agriculture Horticultural Research Station, Tatura. The station was established by the Department to deal with fruitgrowing problems peculiar to this area.

The average annual rainfall of the District is 18 inches. Its irrigation water comes from the Goulburn System, and the main storages are :—

Eildon Weir	.. 306,000	acre feet
Goulburn Weir	.. 20,700	,, ,,
Waranga Basin	.. 333,400	,, ,,

The northern part of the area around Cobram is irrigated by water diverted from the Murray at the Yarrawonga Weir.

Two main methods of irrigation are practised in the Goulburn Valley, the furrow system and the border check or flood system.

The principal crops grown and the area occupied are as follows :—

In 1951–52—

Canning Peaches	.. 9,070	acres
Canning Pears	.. 5,170	acres
Canning Apricots	.. 3,230	acres
Factory Tomatoes	.. 3,340	acres

Market Pears are also an important crop in the Goulburn Valley.

The crop is handled by canneries at Shepparton, Mooroopna, Tatura, Kyabram and Echuca, while pears are packed for export at Shepparton, Mooroopna and Kyabram. Fruit is also sent to other parts of Victoria and interstate for processing and market.

Production

The production of canning fruit in the Goulburn Valley and the way it was used during the season 1951–52, are set out in the table.

	Processed Locally.	Processed Elsewhere.	Fresh Fruit.	Dried Fruit.	Total.
	Tons.	Tons.	Tons.	Tons.	Tons.
Peaches ..	16,545	10,304	2,500	680	30,029
Pears ..	15,374	7,696	6,850	210	30,130
Apricots ..	4,372	2,227	700	100	7,399

The manager of the Research Station, Mr. R. S. Harper, discussing pest control problems with growers at a Station field day.

The Research Staff

R. S. Harper, B.Agr.Sc., Manager.

J. C. Keatley, B.Agr.Sc., Horticultural Research Officer.

B. M. Nicholson, B.Agr.Sc., Horticultural Research Officer.

W. B. Gayfer, D.D.A., Field Experiment Officer.

G. J. Kidman, D.D.A., Field Officer.

D. Hughan, Hort. Certificate, Field Officer.

H. Craig Brown, D.D.A., Field Officer.

G. C. Edwards, D.D.A., Field Officer.

L. A. G. Van Heek, Hort. Certificate, Field Officer.

Irrigation Officers M. W. Jarvis, D.D.A., and A. J. Heslop, L.D.A., work on and from the station.

THE RESEARCH STATION

Total area of the Horticultural Research Station is 104 acres (52 chains x 20 chains).

Crops Grown

The first fruit trees on the Station were planted in 1937 and now there are 50 acres planted to trees :—

22 acres of peaches (for canning),

23 acres of pears (for canning and export),

1 acre of apricots (for canning),

4 acres of apples.

Up to half an acre of tomatoes is planted in some years.

Water Supply

Irrigation water is supplied from the Goulburn irrigation system via the Waranga Basin and the Wilson Channel which bounds the property on the eastern and northern sides. The property has a water-right of 1 in 4.

How the Station Serves the Goulburn Valley Fruitgrowing Area

1. By research into problems of a long-term nature. The work being done at the station on problems of vital importance to the fruit-grower, such as the best rootstock for pears, the correct fertilizer for peaches, and long term effects of various systems of soil management, is outlined in the following pages.

2. Officers of the station, being " right on the spot," can investigate problems immediately they arise. This type of work will be greatly facilitated by a modern laboratory to be built shortly.

3. The station is a centre for research into problems occurring on growers' properties throughout the district.

4. An " up-to-date " weather station which is maintained at the station provides detailed climatic information.

MAIN EXPERIMENTS IN PROGRESS

Peaches—
- Irrigation
- Soil Management
- Fertilizers
- Varieties
- Pruning
- Thinning

Apricots—
- Rootstocks
- Varieties

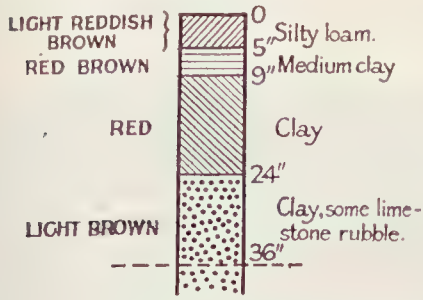
Pears—
- Rootstocks
- Soil Management
- Fertilizers
- Irrigation
- Pre-harvest drop
- Black End
- Pruning

Apples—
- Rootstocks

Soils of the Station

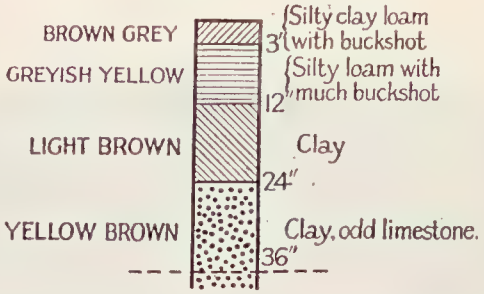
The undermentioned soil types found on the station are generally typical of Goulburn Valley soils in orchards west of the Goulburn River. The location of these soil types is shown on the aerial plan overleaf.

Type A.



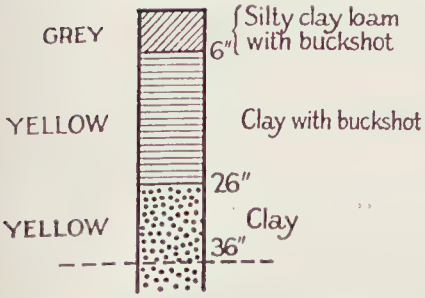
Type A .. Goulburn Valley Silty Loam occurs widely throughout the Valley, particularly around Kyabram and Merrigum, and is similar to "Lockington Loam" at Bamawm.

Type B.



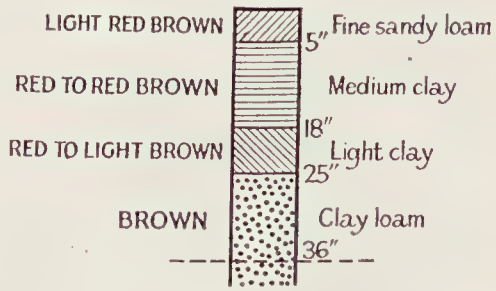
Type B .. A marginal type intermediate between types A and C commonly occurring west of the Goulburn River.

Type C.



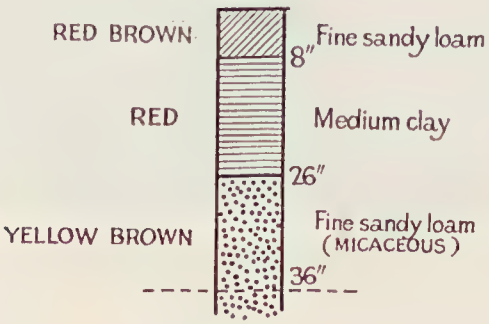
Type *C* .. Occurs typically in buckshot depressions throughout the Goulburn Valley.

Type D.



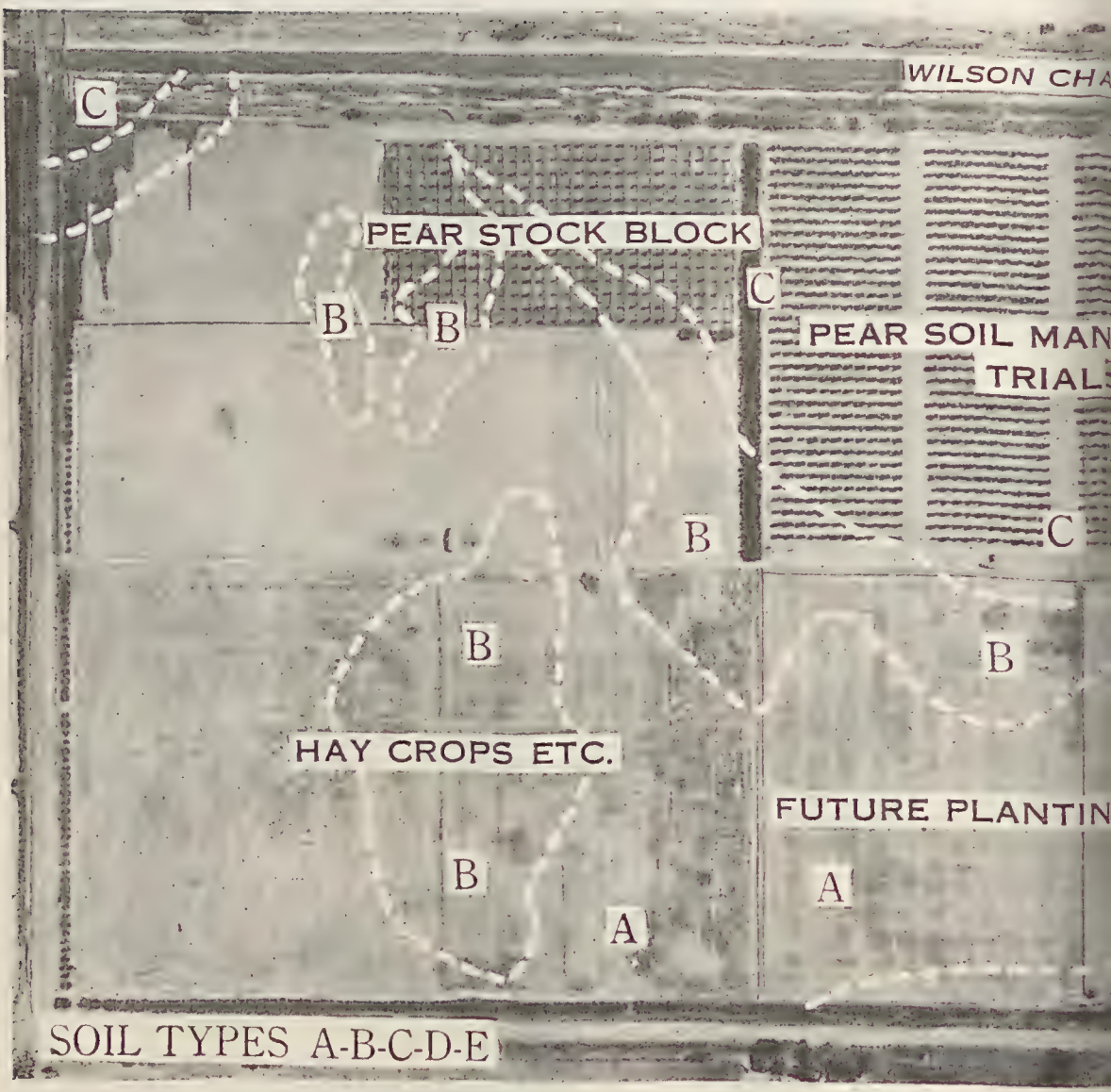
Type D .. Represents the typical profile of the Tongala area and is closely related to "Ballendella Loam" at Bamawm.

Type E.



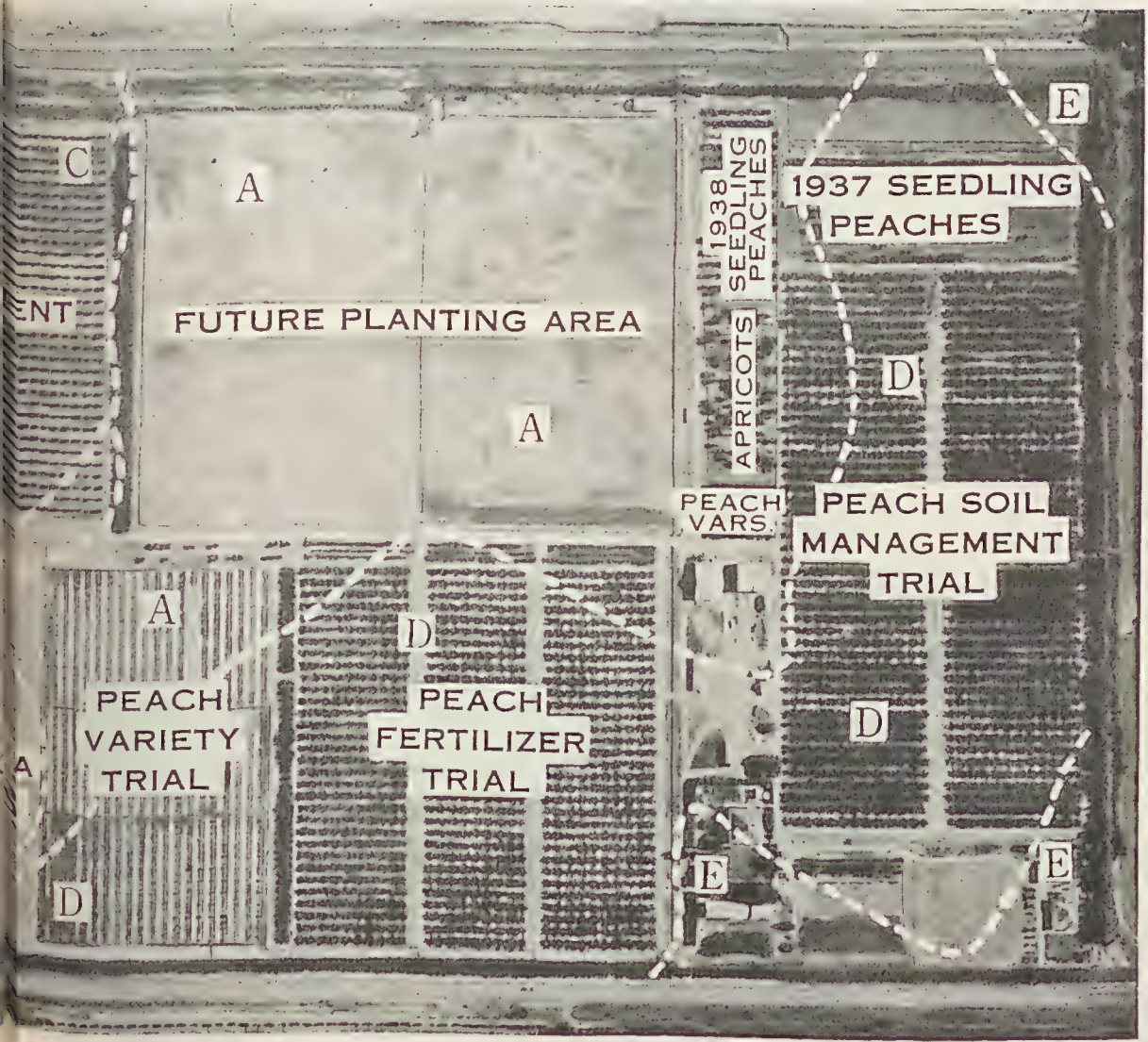
Type E .. Occurs frequently around Shepparton. "Bamawn Sandy Loam" is a related soil.

PLAN OF HORTICULTURA



Aerial photograph of the Station, showing location of the various soi

ESEARCH STATION, TATURA



ee previous page), layout of the experimental blocks, and other features.

PEACH INVESTIGATIONS

A field-day scene on the peach soil management block.

SOIL MANAGEMENT AND IRRIGATION

Clean cultivation throughout the growing season is the best practice for young trees because weed competition for soil moisture and plant foods is eliminated, and pests and diseases can be reduced to a minimum. However, after a number of years of cultivation, heavy soils such as those on the Research Station become compact and cloddy. Irrigation water, which at first soaked in freely will then only penetrate 8 or 9 inches below the surface no matter how long it is held on the surface.

This makes it difficult to "size-up" a reasonable crop of fruit.

Objects of Trial

Pilot trials of alternative soil management systems were commenced in 1946 and in 1948 an eight-acre block of mature Golden Queen peach trees was laid out with the objects of—

(1) Ascertaining the effect on health, growth and yield of the trees under different treatments.

(2) Determining the long-term effect of these treatments on soil permeability, soil structure and, if possible, on the chemical nature of the soil.

(3) Measuring the amount of water used by the different soil management treatments.

Nine different types of soil management are used, and two rates of sulphate of ammonia (5 and 10 lb. per tree) are compared on each treatment. The treatments and broad progress results to date are shown in Table 1 set out on page 125.

Points of Importance to the Peach Grower

After three seasons none of the treatments described in the table is any better than clean cultivation, so far as yields are concerned; permanent swards of subterranean clover and lucerne are so far showing a long-term tendency to depress yields.

When judged on butt-circumference increase, or the weight of prunings, trees do not make as much growth after three seasons under permanent swards of lucerne, subterranean clover, or white clover, as they do under clean cultivation. Summer weeds, straw cover, and alternate bay irrigation for three seasons, also appear to have depressed tree vigour.

Permanent swards have to be supplied with more total irrigation water to keep the fruit growing. Straw cover reduces water requirements, while irrigation of alternate sides of the trees results in greatly reduced water needs though more half-irrigations have to be given than under normal systems of management.

All of these plots are irrigated as soon as the trees need water. Yields could be considerably reduced under any treatment, if water were withheld from the trees when they needed it.

TIMING OF IRRIGATIONS

Accurate timing of irrigations is particularly important for early and mid-season peach trees on impermeable soils. When irrigations are spaced too far apart, a large percentage of the crop will be undersized when harvested. This is a serious economic loss to the grower, and has been a major problem investigated on the station.

Fruit Measurement

A flexible steel tape is used to measure the circumference of tagged fruit every few days throughout the season, on peach blocks both at the station and on growers' properties.

Facts of Importance to the Grower

(1) As the soil dries out, the fruit stops growing before the leaves wilt. If irrigation is postponed until the leaves wilt, a few days growth of the fruit has been lost. This loss cannot be regained and some fruit will be undersized.

(2) When trees are irrigated as soon as the fruit stops growing, a maximum proportion of canning-sized fruit is obtained.

(3) The Department has used this method of fruit measurement on the station with excellent results, and has also advised some 20 growers when to irrigate. This has enabled them to get fruit up to size on many soil types where this was not previously possible.

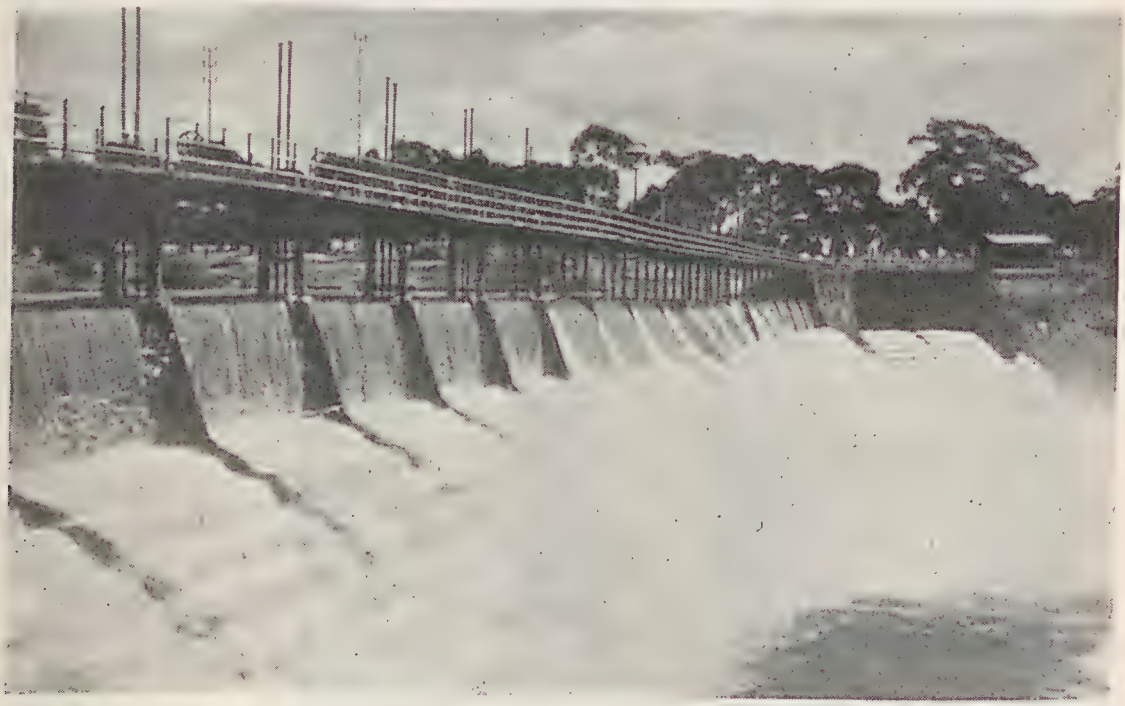
The relation between fruit growth, soil moisture, and evaporation data is being studied, and it is anticipated that, with this information, it will be possible to give advice on irrigation timing to growers throughout the district.

(4) The best methods available to the individual grower are :

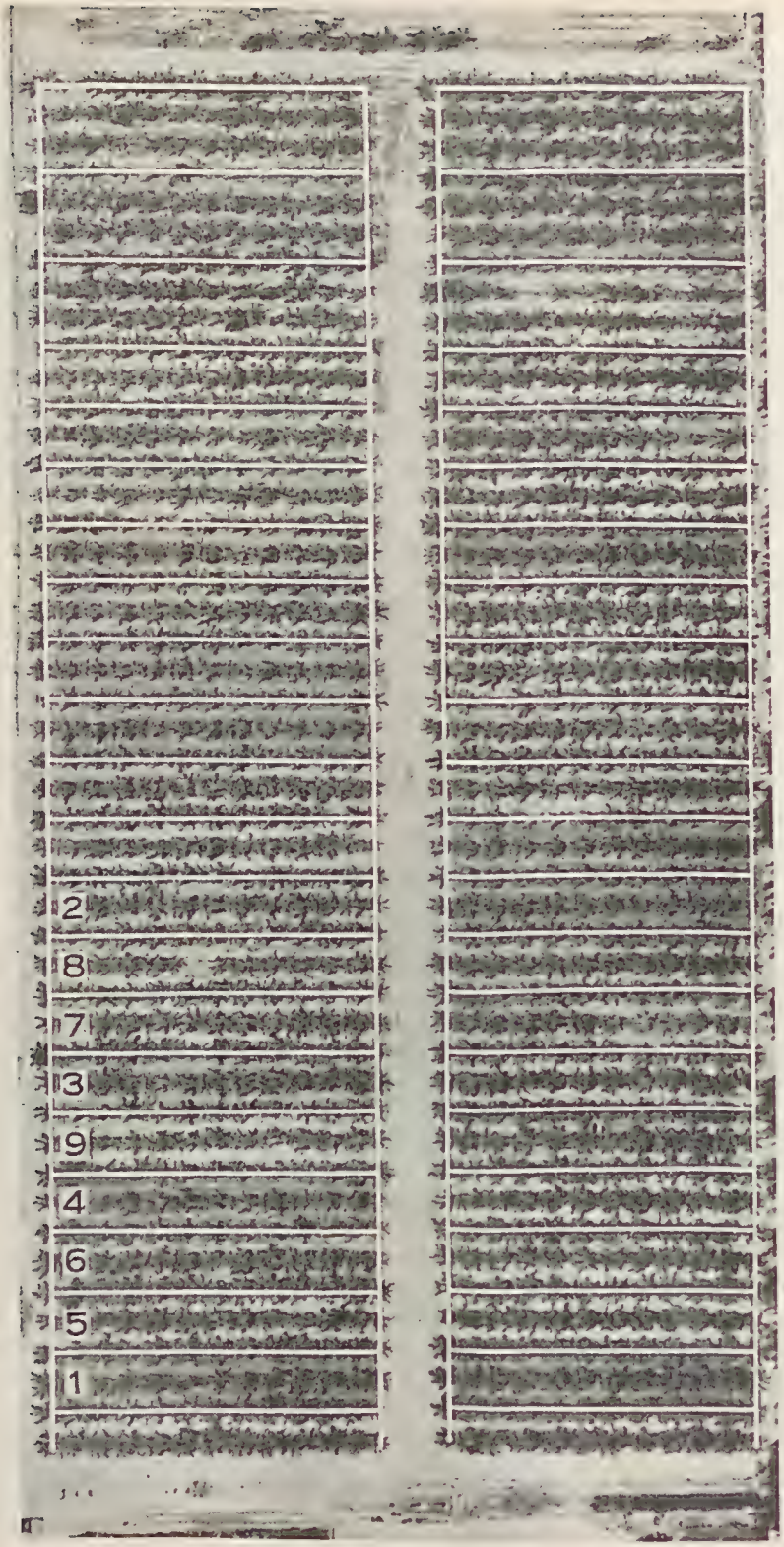
Examine the state of the soil and subsoil with a 4-inch Jarret auger. If the soil in the root zone breaks up or crumbles when run between the thumb and finger, trees should be irrigated.

or,

Tag a dozen fruit in a block and measure these by tape every three days. Irrigate when more than half the fruits stop growing. During stone hardening in November, when the fruits grow very slowly, irrigate when 90 per cent. of the fruits stop growing.



The Goulburn Weir, Nagambie. Water from this storage is used in the Goulburn Valley Irrigation Area.



PEACH SOIL MANAGEMENT AND IRRIGATION PLOTS

The numbered plots indicate the treatments shown in Table 1, opposite.

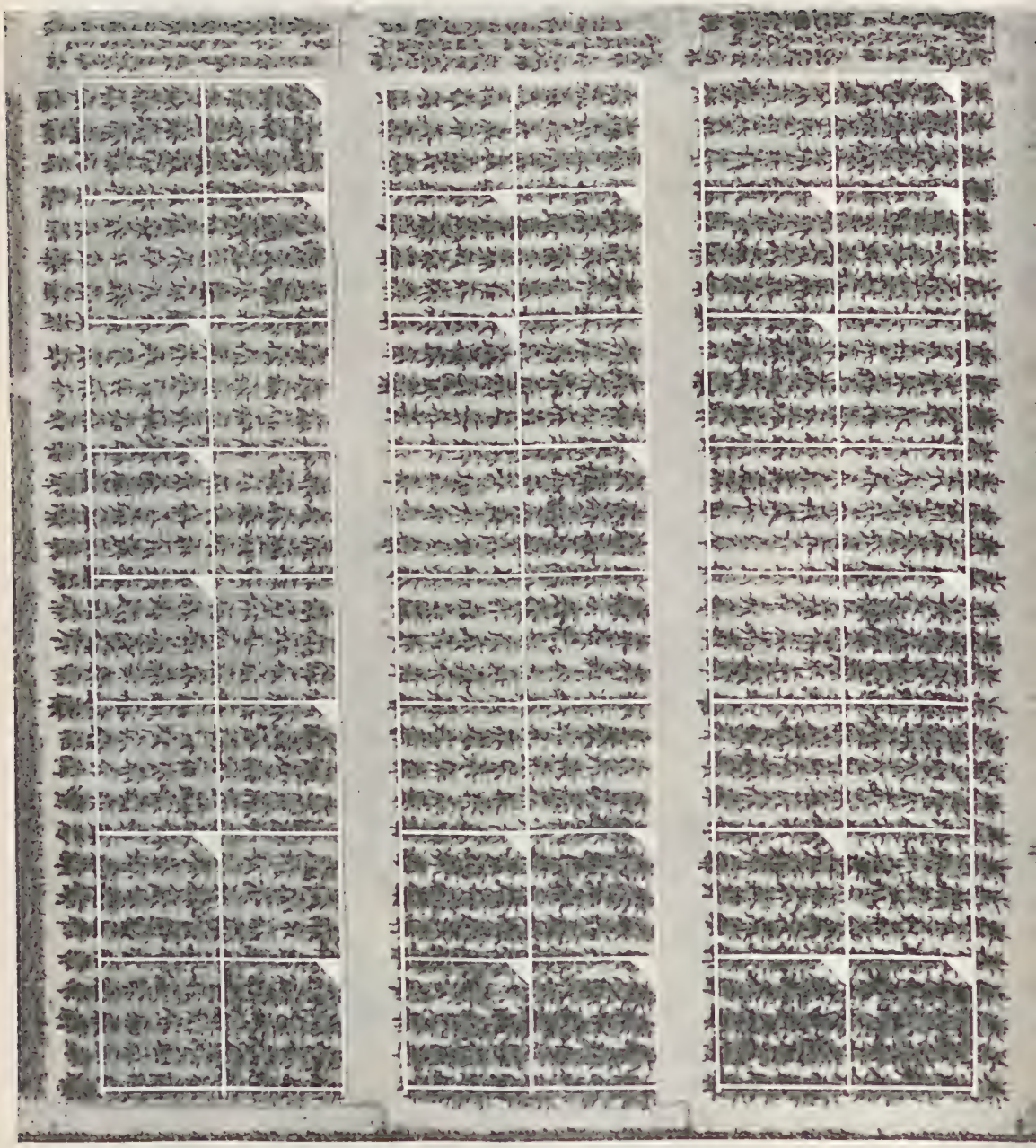
TABLE 1.

These Things are Being Tried.	These Differences Have Shown Up.	
	Water Used per Season.	Tree Growth.
(1) *Clean Cultivation* with sown winter cover crop	This is the control plot—other treatments are compared with this one	
(2) *No Summer Cultivation.*—Clean cultivation throughout spring. No summer cultivation, weeds mown pre-harvest. Volunteer winter weeds after autumn cultivation for winter drainage	About the same as clean cultivation	About the same as clean cultivation
(3) *No Summer Cultivation.*—Clean cultivation throughout spring. No summer cultivation, weeds mown pre-harvest. Sown winter cover crop	About the same as clean cultivation	Less vigorous for the first two seasons. Now there is no measurable difference
(4) *Lucerne.*—A permanent sward of lucerne. Mown regularly, cuttings being left on the surface	About 3 inches more than clean cultivation	Less vigorous for the first two seasons. Now there is no measurable difference
(5) *White Clover.*—A permanent sward of white clover. Mown regularly, cuttings being left on the surface	About 5 inches more than clean cultivation	Less vigorous for the first two seasons. Now there is no measurable difference
(6) *Subterranean Clover.*—A permanent sward of subterranean clover, with summer weeds. Mown regularly, cuttings being left on the surface	About 3 inches more than clean cultivation	Less vigorous for the first two seasons. Now there is no measurable difference
(7) *Kerosene Spray.*—No cultivation. Weed growth controlled by spraying with power kerosene	About the same as clean cultivation	About the same as clean cultivation
(8) *Straw Mulch.*—No cultivation. Straw mulch maintained over the whole area	About 3 inches less than clean cultivation	Less vigorous for the first two seasons. Now there is no measurable difference
(9) *Alternate Bay Irrigation.*—The cultivation and cover crop is the same as No. 3. Trees are irrigated down one side only during the summer, changing sides about once a month	About 7 inches less than clean cultivation	Less vigorous for the first two seasons. Now there is no measurable difference

Other Important Results Obtained so far are :—Tree vigour is greater where 10 lb. of sulphate of ammonia is applied than where 5 lb. is applied; Yields have not shown any definite differences between treatments. However, there seems to have been a slight decline caused by the lucerne and subterranean clover treatments.

Krilium :—Part of treatment (2) has now received a soil dressing of krilium to test the effect on the structure of these soils. Treatment (2) is the method of soil management most commonly used in the district.

PEACH FERTILIZER PLOTS



The plots marked in the top right-hand corner receive 6 lb. sulphate of ammonia per season ; the other plots, 3 lb.

PEACH FERTILIZER TRIAL

Under most systems of orchard management, deciduous trees, especially peaches, give increased yields when the soil nitrogen supply is supplemented by the addition of nitrogenous fertilizers. Phosphorus and potassium are required for proper tree growth, but additions of superphosphate or sulphate of potash to the soil are seldom obviously useful to the trees.

Objects of Trial

A fertilizer trial was commenced in 1944 on a six-acre block of seven-year-old Golden Queen peaches with the object of—

(1) Finding out more about the way to use sulphate of ammonia under Goulburn Valley conditions.

(2) Investigating the value, if any, of superphosphate and sulphate of potash for peaches.

Arrangement of the Trial

The block is divided into 48 plots. These are arranged in six groups of eight plots each, and each fertilizer treatment occurs once in each group.

Results Obtained so Far

Measurements of growth and yield are constantly being made to find out the effects of the various treatments on the trees. Even after seven years the trees have not "settled down"—the treatments are still causing changes in them. Some are improving, others weakening.

The best way to use sulphate of ammonia seems to be to put 3 lb. on in the spring, and another 3 lb. in late January. Superphosphate seems to be improving the trees, potash having the opposite effect, perhaps because of their effects on the soil structure and water penetration.

Facts of Importance to the Grower

1. The fertilizer trial contains trees in many different states of health because of the different fertilizers used. The grower can compare his own trees with them and see whether he should be using more fertilizer—the bigger, more leafy and darker green a tree is, the bigger the crop it can carry.

TABLE 2.—AMOUNT OF FERTILIZER GIVEN TO EACH TREE EACH YEAR.

Fertilizer.		Ammonia.		*Super.	Potash.	Cost per Tree (1952).
When Applied.		Spring.	Late Jan.	Spring.	Spring.	
		lb.	lb.	lb.	lb.	s. d.
Ammonia only	1 a	3	..	..	..	1 0
	1 b	1½	1½	..	..	1 0
	2 a	6	..	..	..	2 0
	2 b	3	3	..	..	2 0
Ammonia and Super.	3 a	3	..	4	..	1 6
	3 b	1½	1½	4	..	1 6
	4 a	6	..	4	..	2 6
	4 b	3	3	4	..	2 6
Ammonia and Potash	5 a	3	..	..	4	2 6
	5 b	1½	1½	..	4	2 6
	6 a	6	..	..	4	3 6
	6 b	3	3	..	4	3 6
Ammonia, Super., and Potash	7 a	3	..	4	4	3 0
	7 b	1½	1½	4	4	3 0
	8 a	6	..	4	4	4 0
	8 b	3	3	4	4	4 0

* The whole block gets 2 cwt. super. per acre each autumn for the cover crop.
The treatments numbered 1 to 8 are given to whole plots.
The "a" and "b" treatments are given to half-plots within the whole plots.
Lime is now applied on half the plots to investigate the effect on soil acidity.

Loading fruit in the soil management block.

2. On soils similar to those of the Research Station, a good programme for peaches is:

3 lb. ammonia for each tree in spring; and another 3 lb. about 6 weeks before harvest.

Superphosphate should be applied in the autumn to obtain a good winter cover crop.

Do not use potash.

PEACH VARIETY TRIALS

Aim

The development of a wider range of canning peach varieties combining the best orchard characteristics, such as heavy and regular cropping, good fruit size, self-thinning habit, and resistance to disease and pre-harvest drop, with good canning quality is being undertaken.

Methods Being Used

(1) Selection from a range of open pollinated seedlings of varieties such as Levis, Paloro, Sims, Golden Queen, Dixon, Pullar, and most of the new varieties introduced from America by Mr. W. Young, in 1935.

(2) Cross-breeding, i.e., the artificial crossing of selected varieties with desirable characters, and selection from the resultant seedlings.

(3) Observation of new varieties and selections from other Australian States and overseas.

Progress Made

During the years 1937 to 1939 approximately 4,500 trees were planted at the Tatura Research Station. Slightly more than 4,000 of these were seedlings of the various varieties in commercial use at that time, and the balance consisted of crossbred trees derived from breeding work with the same range of varieties.

Close observation of orchard characteristics combined with canning trials, made it possible by 1948 to select from this large initial field of material some eleven seedlings and twenty-two crosses which could be regarded as promising. These have been budded on to Elberta peach stocks and the trees were planted out in the field during 1949 and 1950 for further close observation under normal orchard conditions. Unfortunately, a number of trees died following the floods of March, 1950, and the wet winter of 1951. It has been possible, however, to replace these trees during the winter of 1952.

Facts of Importance to the Grower

(1) The best, and perhaps final appraisal of a peach variety can be made only after many years. Certain characteristics of a variety that may be a weakness will be apparent only under special conditions.

(2) The choice or recommendation of a new variety in preference to an old established one, should be made only when some definite gain is obtained, and is best undertaken by the growers and canners in close co-operation.

PRUNING AND THINNING CANNING PEACHES

Most early to mid-season varieties of peaches require thinning because the trees usually set an excessive number of fruit. Although several fruit drops between blossoming and stone hardening normally reduce the number of fruit on the tree by about half, most trees still carry many more fruit than they can bring up to a satisfactory size at harvest.

Objects of Trials

Investigations have been carried out on pruning and thinning over a number of years, to determine the best ways of reducing fruit numbers.

Facts of Importance to the Grower

1. Accurate control of fruit numbers is necessary to get the maximum crop of marketable sized fruit.

2. Pruning alone cannot satisfactorily control fruit numbers, and should be used only to maintain a balance between fruiting and growth.

3. Hand thinning is usually essential.

4. Under good cultural conditions the number of fruit to be left on a tree can be decided by measurement of the butt. At the Research Station, trees can carry about 45 fruits per inch of butt circumference.

5. Early November thinning allows a bigger crop to be carried than the normal December thinning, but there is some risk of further natural thinning occurring. If thinning is delayed till January, the number of fruit must be reduced by 20 per cent. more to gain sufficient size.

Preliminary trials of a few chemical thinning sprays have not been successful, but new sprays are under trial.

PEAR INVESTIGATIONS

SOIL MANAGEMENT TRIAL

During 1952, a soil management and fertilizer trial was commenced in the main pear block to investigate the long-term effects of four different surface treatments on growth and yield of mature trees. This block was planted in 1937 and is of ten acres divided into four equal sections or bays.

Bays 1 and 2 .. Packham and Josephine in alternate double rows.

Bay 3 .. Williams' Bon Chretien—with Beurre Bosc interplanted as a pollenizer.

Bay 4 .. Williams' Bon Chretien—no pollenizer.

Since this block was planted, observations have been made on:

The use of a wide range of minor elements.

The normal rate of growth of the fruit in the three main varieties.

The effect of pollination on the variety W.B.C.

The behaviour of the soil type under irrigation.

Now the trees are mature the soil management trial has been commenced and these are the four treatments:—

1. White Clover—no cultivation, a permanent sward of White clover.
2. Surface Mulch—no cultivation, straw mulch on half the plot.

   No cultivation, sawdust mulch on the other half.
3. Oil spray—no cultivation, weeds controlled with kerosene sprays.
4. Control Treatment—clean cultivation in spring, volunteer summer weed growth.

For the time being, fertilizer will be tested only in bays 3 and 4 on the W.B.C. variety.

Sulphate of ammonia at different rates and times of application, will be compared with a standard spring dressing of 5 lb. Nitro-chalk, a neutral nitrogenous fertilizer will also be tested. Spring dressings of superphosphate will be tried in addition to the autumn application.

Later, fertilizers will be tested on Packham and Josephine also.

ROOTSTOCKS

In a search for better stocks than those in use at present, i.e., to give more uniform trees free from black end, these stocks are under trial.

In 1941 a four-acre block of W.B.C., Packham, Josephine and Beurre Bosc was planted on seedling rootstocks of the following varieties :—Keiffer, Winter Nelis, Winter Cole, Cole's Hybrid, Beurre Bosc, Broom Park, Josephine, L'Inconnu, Packham and Beurre de Capiaumont. Some of these trees are pruned to the normal system and some to the modified central leader system.

In 1951 a further rootstock trial of four acres of the varieties W.B.C., Packham, Josephine, and Winter Nelis was planted. Stocks used are seedlings of the oriental pear species *Pyrus indica*, *Pyrus betulaefolia* and *Pyrus calleryana* (three types, including the D6 strain from New South Wales) ; and the European pear *Pyrus communis* using a seedling from the cross Keiffer x d'Anjou.

Facts of Importance to the Grower

Of the stocks planted in 1941 Winter Nelis seedlings appear to give the most vigorous trees for all varieties except Josephine.

Keiffer seedlings are consistently good for all four scion varieties. Winter Cole and Broom Park are fairly good, and L'Inconnu promising. Beurre Bosc seedlings seem to be the poorest of the seedling stocks under trial, and their use would not be recommended.

There is no difference yet between the pruning systems.

Other Pear Problems under Investigation

Pre-harvest drop sprays.

Black End.

Various forms of pitting, such as Transmissible Stony Pit, Lithiasis and Corky Pit.

Mineral deficiencies.

APRICOT INVESTIGATIONS

Improving the Variety

In 1938, about 1,000 open pollinated seedlings of the varieties Tilton, Trevatt, Moorpark, Blenheim and Shipley were planted out. These have been culled to leave about 60 of the most promising types.

The aim is to obtain a type that has high quality fruit, and which would be earlier or later in maturity than the present canning varieties, enabling the season to be extended.

Rootstock Trial

A small trial of one acre of the varieties Trevatt, Tilton, Moorpark, and Riverside was planted in 1951 on the following rootstocks :

Lady Palmerston and Elberta peach seedlings, apricot seedlings, Marianna and Myrobolan plum.

Unfortunately few trees survived the wet conditions of the past winter. The survivors were all on plum rootstocks.

Black Heart

Observations are being made on a limited number of Trevatt apricots, worked on apricot and plum stocks inoculated with this disease.

OTHER PROBLEMS UNDER INVESTIGATION

Other problems being investigated by the Station staff and other officers of the Department of Agriculture are :—

Brown rot of peaches.
Replanting old peach land.
Pre-harvest drop of peaches.
Non-development of buds of apricots and peaches.
Virus diseases of peaches and pears.
Cool storage and ripening of W.B.C. pears.

TOMATO DISEASES AND THEIR CONTROL

Contributed by Officers of the Biology Branch

THE main purpose of this series of articles is to present to growers a brief description of the more important tomato diseases present in Victoria, together with the methods available for their control.

The grower should have a clear idea of what is meant by the term "disease" as applied to plants. Disease in plants has been described as a disturbance of, or a deviation from, either normal function or normal structure, or both. It may affect the whole plant or only part of it. This disturbance of the vital functions of the plant may be brought about by parasitic or non-parasitic causes. Parasitic diseases may be caused by viruses, bacteria, fungi, eelworms, and insects; whereas non-parasitic plant diseases are caused by improper environmental conditions, some of which are imperfectly understood.

The manifestation of disease in plants is called "symptom expression," and usually symptoms are definite for each disease.

There are symptoms resulting from the death of plant tissues, such as rot, canker, blight, wilt, damping-off, streak, and burn.

There are symptoms which are the results of overgrowths such as are exhibited by the presence of galls, and finally there are manifestations of a slowing down of growth or dwarfing of plant tissues which are striking symptoms of some of the virus diseases.

As tomato growers can identify a disease only by its symptoms, the following key should assist them with identifications. Where difficulty is experienced, growers are advised to submit specimens for identification to the Plant Research Laboratory, Department of Agriculture, Burnley, E.1.

KEY FOR THE IDENTIFICATION OF TOMATO DISEASES.

A.—Diseases Causing Stunting, Wilting, or Death of Plants

(a) Resulting from Soil Infection.

(1) Constriction of stems at ground level, the seedlings toppling over. "Damping-off" (p. 126).

(2) Wilting of the leaves during the warmer and brighter times of the day during cool weather. Plants usually recover at night and wilt again during the day.

Internal browning may be traced from roots, often extending to the top of the plant. Verticillium Wilt (p. 128).

(3) Similar in symptoms to (2). Internal browning does not extend to top of the stem. Disease favoured by high temperatures. Fusarium Wilt (p. 128).

(4) Lower leaves turn yellow with premature defoliation. Roots rotted, minute black bodies seen in wood, core, and on the outer surface of the roots. "Black Dot" Root Disease (p. 127).

(5) Rapid decay of stem at ground level or of leaders in contact with the ground. Dense mass of white fungus threads on decayed areas and black fungal resting bodies in stem cavity. Sclerotinia Stem Rot (p. 12).

(6) Rapid wilting of the entire plant without yellowing of the leaves. Bacterial Wilt*.

(7) Plants become stunted, the foliage turns yellow and nodular swellings are present on the roots. Root Knot Eelworm*.

(b) Resulting from Foliage Infection.

(1) Bronze markings on the young leaves followed by "tip-blighting" and growth stunting. Yellow rings or blotches on ripe fruit. Spotted Wilt*.

(2) Spike-like shoots with undeveloped leaves and a bluish or purplish tinge. Greening and enlargement of the flowers. Big-bud or Blue-top*.

(3) Dark and light green or bright yellow mottling of the leaves. Slight growth stunting. Mosaic*.

(4) Brown streaks on stem and brown depressed areas on fruit. Streak*.

B.—Diseases Mainly Affecting Foliage and/or Fruit

(1) Numerous small circular spots with grey centres on older leaves, followed by partial or severe defoliation. Septoria Leaf Spot*.

(2) Pale, greyish mould on under-surfaces of leaves, changing in colour to purple. Affected leaves turn yellow and finally orange. Leaf Mould*.

(3) Circular dark spots with concentric rings on leaves and fruit. Plants partially defoliated. Early Blight*.

(4) Dark water-soaked patches on leaves and fruit, enlarging rapidly in cool moist weather. Late Blight*.

(5) Bird's-eye spotting of the fruit and one-sided wilting of the leaves, occasionally with open fissures or cankers on the stem. Bacterial Canker*.

(6) Brown scabby spots $\frac{1}{8}$ to $\frac{1}{4}$ inch in diameter on fruit and small water soaked spots on under side of leaves. Bacterial Spot*.

(7) Numerous slightly raised dark specks scattered over surface of fruit. Bacterial Speck*.

* The diseases and disorders indicated with an asterisk will be dealt with in subsequent instalments of this series of articles —Tomato Diseases and Their Control.

(8) Circular depressed spots on the fruit. Anthracnose*.

(9) Foliage symptoms similar to those of early blight. Small, slightly sunken spots with dark margins and greyish brown roughened centres on fruit. Nail-head Spot*.

C.—Disorders or Abnormalities Resembling Parasitic Diseases

(1) Large circular, depressed area with dark leathery surface at blossom end of fruit. Blossom-end Rot*.

(2) White papery depressed areas on surface of fruit exposed to the sun. Sun scald*.

(3) Fruit excessively deformed and partially segmented. Catface*.

(4) Radial or circular cracks at the stem end of the fruit. Growth Cracks*.

(5) Older leaves excessively inrolled and leathery to touch. Leafroll*.

(6) Plant dwarfed with excessively malformed leathery foliage. Stems develop white cankerous outgrowths, immature roots, and split longitudinally. Hormone Injury*.

FUNGAL DISEASES

"Damping-off" of Tomato Seedlings

Practically all growers of tomato seedlings are familiar with the damping-off diseases. These are caused by various soil-inhabiting parasitic fungi—*Phytophthora cryptogea*, *Pythium de Baryanum*, and *Rhizoctonia solani*.

The above-mentioned diseases are characterized by the toppling over of infected seedlings in patches any time after they have emerged from the soil until their stems have been hardened sufficiently to resist infection.

* See footnote, previous page.

Infection occurs at soil level; the stems become constricted and then collapse. There is, however, a phase of this disease which is not often recognized, and which growers usually attribute to poor germination or seed of low vitality. In this phase, the young seedlings are killed before they reach the surface of the soil. It is not uncommon to find the typical damping-off symptoms complicated by the presence of a root rot disease in which the roots die back from the tips.

Damping-off diseases are favoured by poor aeration, over-crowding of plants, excessive moisture, and high temperatures. As the parasitic fungi responsible for these diseases are soil borne, it is most important that growers should not use the same soil in the seed beds year after year unless it has been efficiently sterilized.

Commercial nurserymen raising tomato seedlings for growers usually maintain large reserves of soil in a heap from which the boxes are filled. This soil will become heavily infested with the damping-off fungi where boxes containing diseased seedlings are tipped out on the soil heap, as is often the case in practice.

For commercial nurserymen raising large numbers of tomato seedling plants for growers, it is most important that an effective steam sterilizer should be installed and that all soil used, not only for the sowing of the seed, but also for the pricking out of seedlings,

"Damping-off" disease affecting a patch of tomato seedlings.

should be thoroughly sterilized, and that new boxes only should be used.

Steam sterilization is effected by continually passing large quantities of steam at high pressure (60 lb. to the square inch) into the soil until the soil temperature is about 210° F. The treatment should then be continued for 1 to 1½ hours. This treatment effects the eradication of the harmful soil organisms and will completely control damping-off diseases. It is important that the sterilized soil should be aerated for approximately three weeks before it is used.

Tomato seedlings attacked by the "damping-off" fungus, showing constriction of the stem at ground level. The two seedlings at the right are healthy.

For the sterilization of old boxes the formalin method is employed. One gallon of commercial formalin (40 per cent. formaldehyde) is diluted with 49 gallons of water and the boxes are thoroughly saturated with this solution, stacked in a heap, and covered with sacking or a tarpaulin for 48 hours.

Where steam sterilization facilities are not available for commercial nurserymen, formalin sterilization may be employed. Soil may be heaped in layers of one foot and saturated with a 2 per cent. solution, i.e., 1 gallon of commercial formalin to 49 gallons of water.

A further layer of the same thickness may then be added and saturated as before. One ton of soil requires about 40 gallons of diluted formalin. After treatment, the soil should be covered with a tarpaulin or sacking for 48 hours, after which time the covering should be removed and the soil spread out into a thin layer until all odour of the formalin has gone.

For the sterilization of tomato seed beds on the farm, this method may also be used. After watering with the formalin solution, the seed beds should be covered with sacking as before for two days, after which time the covering should be removed, the treated soil forked and aerated for ten days to two weeks before sowing.

"Black Dot" Root Disease

"Black Dot" root disease has at times caused serious damage to tomato plants grown in northern Victoria. The main effect of this disease is the premature death of the plant usually by the end of February. This is a serious matter in a district where the sale of the late crops to the pulping factories is an important adjunct to the earlier market trade.

The fungus causing this disease *Colletotrichum atramentarium* may infect the plant at a very early stage of growth and, although the parasite may be present in the roots, a well-grown plant may show no signs of the disease and set six trusses of fruit. By this time the vigour of the plant is much reduced and the disease asserts itself. The affected plants are stunted and the lower leaves turn yellow and fall. There is a gradual failing of the plants and they soon die.

The root system and the base of the stem of the affected plants are shrivelled, some of the roots are devoid of cortical tissue and show the central wood core covered with minute black dots. These small black dots are the resting bodies of the causal fungus, and it is by means of these bodies that the fungus is carried over from year to year in the soil. These bodies may also be found within the hollow stems of affected plants. Conditions under which the soil becomes too dry and is then heavily watered appear to favour this disease.

Control.—For the control of "black dot" disease it is important that the seedlings should be raised in sterilized soil and that

healthy seedlings only should be planted out on land which has not grown tomatoes for several years. Care should be taken to ensure that the moisture content of the soil is maintained without excessive variations. Diseased plants should be carefully removed and burnt, and they should on no account be ploughed into the soil. Potatoes should not be included in the rotation, as they also are attacked by this fungus.

Tomato plant affected with fusarium wilt.

WILT DISEASES

Verticillium Wilt

Verticillium Wilt, which is caused either by *Verticillium albo-atrum* or by *Verticillium dahliae*, two closely related soil fungi, occurs in the cooler areas of this State. The affected plants at first show a tendency to wilt during the warmer and lighter times of the day and they usually recover at night and wilt again next day. As the disease advances, the lower leaves turn yellow and the affected plants die. If the plants are split open a brown discolouration may be observed extending to the top of the plant. The wilting of the foliage is largely due to poison manufactured by the fungus within the plant.

Fusarium Wilt

The wilt caused by the soil fungus *Fusarium lycopersici* is very similar in symptom expression to Verticillium Wilt. Tomato plants are liable to attack by the fungus in all stages of growth. The first sign of the disease is a slight wilting and drooping of the lower leaves, finally the entire plant wilts and dies. The fungus enters the roots and grows in the water and food-conducting channels of the infected plant. If the stem of the infected plant is split, a brown discolouration may be observed extending up the stem of the plant. The fusarium wilt occurs during the hot summer months, whereas the Verticillium Wilt is a low temperature disease. Verticillium Wilt has caused serious losses in early glasshouse tomatoes in the Murray Valley area, where they are grown during the winter when soil temperatures are low.

Control.—As the organisms causing these diseases are soil borne, it is important that diseased plants should be collected and burnt. After harvesting, all plant remains should be destroyed. They should on no account be ploughed into the soil. Tomato lands so affected should be given over to the growing of some non-susceptible crop for a number of years. The Fusarium Wilt organism attacks only tomatoes, so that any other crop may be planted. The Verticillium Wilt organisms, however, parasitise a number of plants, and for this reason potatoes

should not follow tomatoes where Verticillium Wilt has occurred. The soil should also be kept free from such weeds as Black Nightshade and Fat-Hen, as these may carry infection. As a further safeguard against these diseases it is important to raise healthy seedling plants in sterilized soil and to plant on new ground or ground that has not grown tomatoes for some years.

Sclerotinia Stem Rot

Two forms of stem rot caused by different species of the fungus *Sclerotinia* occur in Victoria.

The more frequently encountered form, caused by *Sclerotinia sclerotiorum*, is of minor importance. It occurs occasionally on land heavily infested with this disease from a previous susceptible crop. Plants which are highly susceptible to Sclerotinia Rot include cabbage, cauliflower, lettuce, French bean, passion fruit, and sunflower.

The fungus attacks the lower stem region and causes a rapid decay of affected tissues. Under damp conditions, a white cottony growth of fungal threads may appear on the outside of the stem, and large black fungal bodies (sclerotes or resting bodies) develop within the pith cavity.

Another form of stem rot is prevalent in the Bacchus Marsh district. This is believed to be due to the fungus *S. minor*, which may be distinguished from the above disease by the formation of much smaller sclerotes inside the stem. It would appear that the tomato is more susceptible to *S. minor* than to *S. sclerotiorum*.

Stem rot seldom occurs until late in the growing season, as both fungi require cool moist conditions for infection. Heavy foliage growth or overgrowth with weeds will prevent the plants from drying out after rain and so create ideal conditions for infection.

Control.—Diseased plants should be removed and destroyed by fire. They should not be ploughed in. Plants should be well-spaced, weeds and other cover should be removed and the ground between plants should be well worked, so as to allow better aeration of the soil and also increased ventilation between the plants and rows. As the fungus is sensitive to copper sprays or a relatively high level of copper in the soil, spraying with Bordeaux mixture 4 : 4 : 50 or dusting with copper dust on the soil around the base of the plant will assist in preventing the spread of infection.

A further instalment of this series of articles, Tomato Diseases and Their Control, will appear in a subsequent issue of the Journal.

Book Review

Irish Agriculture in Transition.—*By Joseph Johnston*

McMillan & Co. Ltd., London ; 15/- stg.

The main object of this book is to point out ways and means of increasing production of primary products, an objective of equal importance in Australia. Increased output per man and per acre is the answer, according to the author, and this is possible only by increased mechanization. This is well-nigh impossible with the very large number of small farms in Eire to-day, and he suggests an extension of the method already adopted in some areas where the local co-operative creamery takes over a farm of 250-300 acres as near the centre of its collecting area as possible and develops this farm to the full by mechanization. Not only is an excellent demonstration of what can be done by modern methods provided on this farm, but machines are purchased in excess of requirements for the running of the farm so that they can be hired out to the small farmers nearby who cannot afford to buy them.

All those interested in the problems associated with attempts to increase production of primary products in Australia will find this book interesting, if only as an illustration of the very wide variation in the factors that must be taken into consideration in different countries to achieve success. Professor Johnston is to be congratulated on a valuable contribution to the literature on Irish agriculture.

[C. W. STRUTT.]

Zone 8 (Central Gippsland)

Steady improvement each year has now brought Mr. A. McLean to first place in this zone. The water supply, drawn from the Drouin town supply, has been further reticulated over the farm to excellent concrete troughs, and this has assisted in finer control of grazing.

The building up of fertility has also proceeded by the spreading of manure on paddocks which had previously been depleted by too frequent cutting for hay. Trials laid down to test the potash status revealed a deficiency in some paddocks, and the applications of potash which followed resulted in a much stronger clover growth.

As pastures have improved it has become possible to conserve more hay, which is stored under cover, and Mr. McLean has now reversed his former policy of liberal concentrate feeding.

The dairy premises are solidly constructed, with lavish use of concrete, and a high standard of hygiene is always maintained.

Mr. L. M. Johnson, second in the zone, is already well known, being twice State reserve champion in former competitions.

Steady pasture development has followed the noteworthy changes made in his farm layout during the winter of 1950. Efforts are still being made to build up the weaker paddocks, and additions to the rabbit-proof fencing have had a beneficial effect on paddocks near the railway, which was the source of previous infestation.

A feature of Mr. Johnson's management is his ability to construct simple but effective pieces of equipment. Before the past harvest season, he adapted a horse sweep for attachment to the rear of a tractor with hydraulic lift, and with this buckrake, he successfully made a wedge-shaped silage stack on one of his hillsides, and was also able to graze a substantial aftermath in that paddock.

Zone 2 (Goulburn Valley)

First place for the zone went to Mr. E. R. Ennals, of Cobram, who ranked third in the State in 1949 and occupied second place in the zone in that and the following year.

In the eight years for which he has occupied the farm much has been accomplished. The layout is good, and many trees have been planted for shade and shelter, and to beautify the home and its surroundings. A later addition is a capacious hayshed. Into his machinery shed is also built a platform for the convenient storage of superphosphate.

The 118-acre farm has a water-right of 1 in 2 which, with sales of excess water usually available, gives Mr. Ennals the use of some 200 acre feet annually. To meet this situation he has been careful to diversify his pastures. Sixty acres of Wimmera rye grass and subterranean clover are economical of water and provide excellent feed for the cows until the perennial pastures make substantial growth. To take advantage of this, calving of the herd is arranged to commence early in July. A small area is also sown to phalaris, mainly to be used as hay.

Mr. Ennals has been an active member of the Cobram Herd Testing Association for a number of years, and the development of his 50-cow herd has been based on good use of herd-test information. A careful record is kept of the treatment of each paddock, especially with reference to times of watering.

Mr. R. N. Browning, a soldier settler at Yarroweyah, has now moved from fourth to second place in the zone—a creditable achievement as he has occupied his property for only four years. The 96-acre farm is sub-divided into eighteen paddocks, including five used for calves. Two separate sets of calf-feeding bails make it possible to give the calves complete changes of pastures.

This property is still very much in process of development, and the final outcome of work now being done will be of the greatest interest.

To Mr. D. A. Dobson, of Benalla, also in this zone, goes the section prize, "Effective Use of Skim Milk (or whey)".

Zone 1 (North-East)

Improvements made to their farm layout and the provision of a new hayshed, led Mrs. B. McIlroy and Sons to share the section prize for "Farm Planning and Care of Equipment" with Mr. G. Trease of Zone 9. They also won the prize for "Methods in the Dairy" as well as the first place in Zone 1.

This farm and the methods employed on it have already been described in detail in previous years, and many who have attended field days on the farm have seen the lavish but soundly-planned dairy premises.

There is now further sub-division of this 302-acre property, and laneways have been formed and crowned, while there has been some renewal of pastures on paddocks previously cropped. The three haysheds are situated on different parts of the farm to lessen distances of cartage, both at harvest time and when the hay is fed out, and these sheds are fenced and netted against stock and vermin.

About half the cows in the herd are registered Jerseys of the "Edi" stud, and the present culling programme is dictated in part by the aim to develop a herd composed entirely of stud animals.

Five bulls bred by the owners have each been used sparingly in the herd. They are then loaned to neighbours and will be brought back for further use if the quality of their first progeny justifies this course.

Mr. R. J. Waters, of Corryong, has carried out much developmental work in the four years he has spent on his present property, and he has many more plans for the future. What he has already accomplished served to lift him to second place in the zone.

Further sub-division is the main need on this farm at present, and this is gradually being done, while new pastures are being sown after oat crops. Good use is being made of strawberry clover on the creek flats, and some lagoon bank areas have been reclaimed by regrading.

Coming to dairy farming from another walk of life, Mr. Waters has been greatly receptive to and interested in all modern farming techniques, and he is likely to make further rapid progress in the years to come.

Zone 5 (Mid-Western District)

Mr. H. Savage, of Timboon, zone winner in 1950 and second in 1951, gained premier place in this zone. His problems differ greatly from those of most of the competitors so far discussed, as he is still developing a farm from its initial bush-covered state. He is, however, fortunate in the climate and soil type which allows of the direct establishment of perennial pastures on new ground without a prior period under subterranean clover. More land is still being cleared by bulldozer under contract and sown down to pastures.

A new departure this year was the making of silage. Horses and a tumbler sweep were used, the sweep being taken up on to the stack on wooden skids. The top of the stack was consolidated and weather-proofed with timber.

A mixed crop of Sudan grass and millet is grown for summer fodder on the property of Mrs. B. McIlroy and Sons, on the King River, near Moyhu. The crop is subdivided with an electric fence and fed off in sections.

A noteworthy feature on the farm of the competitor placed second in the zone, Mr E. H. Podger, of Camperdown, was the modern brick dairy now under construction.

Mr. Podger is also keenly interested in pasture-developmental work, but this was hindered in the past season by the continued wet weather. One experiment thus delayed was the sowing of "H1" rye grass, which will now be sown down this year. It will be of interest to see what results this grass will give in that district.

Zone 10 (South-West Gippsland)

Mr. W. Papworth, of Phillip Island, who has always been a strong contender in this zone, has now risen to first placing, and also has the distinction of winning the section prize, "Bookeeping and Business Management," in all four Dairy Farm Management Competitions. His system of record keeping is most comprehensive and, although he finds that it is easily maintained by making it a matter of regular routine, not many dairy farmers would be prepared to adopt such a complete system, and simpler methods seen in use on other farms would doubtless have greater appeal. Nevertheless, in Mr. Papworth's hands, his system fulfils the function of a good record-keeping system, and it has, therefore, received the credit due to it.

Mr. Papworth is now using the new dairy which was under construction last year. Not only is he reaping the benefit of working in such high-class premises, so easily cleaned, but he also has the use of the old building as an implement shed and tool storage.

Moving with the times, Mr. Papworth has, this year, made the buckrake part of his fodder-conservation equipment and has conserved silage in hillside pits.

Development of soil condition and structure through good husbandry is the object of Mr. J. Gardiner, of Ventnor, second in the zone. He is among those enlightened farmers who recognize the important role played by organic matter in the creation of optimum soil conditions.

Another noteworthy feature on Mr. Gardiner's farm is the system of pig management. The layout of pig enclosures is simple and fences are good, while the pens and feeding arrangements make for easy working and cleaning. The pigs themselves are of high quality. Mr. Gardiner was a close contender for the section prize, "Use of Skim Milk".

Zone 3 (North-West)

Mr. W. H. Hamley has an 800-acre property at Dingee, of which 143 acres are used for his dairying venture. Thus he is able to concentrate on his dairying land 1 acre-foot of water per acre although his overall irrigation right is 1 in 4. Sixty acres of the dairying area are under first-class permanent pasture from which much Dingee white clover and perennial rye grass seed is harvested for sale. Some 54 acres are in Wimmera rye grass and subterranean clover and, in keeping with this policy, the 45-cow herd has its main calving time in March and April. The remaining 29 acres are dry land carrying native grasses.

Ample reserves of high-quality hay are made and fed as chaff. The chaff is blown up into a high storage house and, from there, it is moved by a worm—on a principle similar to that of the grain auger—to a feed bin in the milking shed.

A feature of the excellent record-keeping system conducted by Mrs. Hamley is the comprehensive cross-indexing which makes for ready reference and extraction of any desired information.

A well-stocked hayshed on the farm of Mr. E. R. Ennals, Cobram.

Second to Mr. Hamley were Messrs. J. English and Son, of Langville. A feature of this farm was the excellent herd of grade Jerseys, which are well handled and very quiet. The 60 cows which completed lactations under test in 1951–52 made an average of 421 lb. butterfat.

The large property—690 acres—has a 1 in 5 water-right, but a good deal of the available water is used on permanent pastures which are topdressed with 3 cwt. of superphosphate per acre.

Crops are grown extensively to provide feed for cows and pigs.

To maintain the high standard of their herd, these farmers must find bulls which are likely to be "production pure-breds", able to transmit to their progeny the high productivity of their ancestors. They have not hesitated to select, as their junior herd sire, a grade bull which has every prospect of fulfilling that condition.

Zone 6 (Near Western District)

Once again Messrs. J. Lyness and Sons, of Colac, and Mr. J. J. Bubb, of Springbank, obtained the first and second awards, respectively, in this zone. These two farms—the first a large family venture, and the second a smaller single-labour-unit farm—have already been fully described in the reports for previous years.

The Lyness family continues to develop the total holding of 203 acres but, in this, they were much hampered by the very wet season which adversely affected pastures. A new feature is the hayshed built during the past season. This is completely enclosed with a drive-way through the middle. Hinged ventilators are provided which can be opened while hay is being stacked in the shed. A home-made hay elevator is used in stacking operations.

The bull paddock has been double-fenced and encircled with a plantation of trees, and other new plantations have been established about the farm.

Mr. Bubb's main problem in farm development is the raising of the level of fertility on a farm which was somewhat depleted by frequent cropping in the past. Forage crops, mainly rape and chou moellier, are a part of the programme of laying down new pastures, while pasture harrowing, topping, and the feeding out of hay on the most depleted areas also play their part. "H1" rye grass has been included in the more recent pasture mixtures to provide late winter and early spring feed and to compete with early weed growth. The electric fence is used mainly for the strip grazing of the forage crops.

On this farm also, shelter belts are growing well.

Zone 4 (Far Western District)

Just prior to last harvest season, a survey was made of fodder reserves carried over from the previous year on 1,742 dairy farms throughout Victoria. About half of the farms in the survey had carried over no reserves whatever, and on many of the remaining farms the stock of conserved fodder was pitifully inadequate.

Mr. L. L. Simkin, of Merino, again leader in Zone 4, is one of the exceptions in this regard, but what he is doing could be equally well done by many others. He conserves surplus pasture growth as silage in pits rather than stacks. In pits it keeps in better condition over a long period. In this way a very substantial drought reserve is being built up. During the past harvest, two pits were filled, while a third was carried over from the previous year.

The advantages of such a reserve in drought-liable areas are obvious, but last season's experience showed that those in the better-rainfall districts might equally well provide against the unusually severe or wet winter, which can reduce supplies to a dangerously low level.

Mr. Simkin was one of the early users of the buckrake for silage making. The silage is cut at a stage when the ground still holds sufficient moisture to make possible a substantial re-growth of pasture, which not only provides further succulent grazing, but ensures a density of sward which will suppress weed growth. Hormone weedicides are also used as a further attack on the weed problem.

Forage crops were grown for summer feed and to clean paddocks prior to the laying down of new pastures, and some barley was harvested as hay. Selected areas are also put into lucerne.

In breeding the herd replacements, special attention is given to suitability of the animals to modern milking techniques and, at this stage, low producers are retained in the herd until such time as they can be replaced by something better. Buildings are sound and are well maintained by painting, and shelter belts are being extended.

Messrs. E. E. Wright and Son, of Illowa, second in Zone 4, engage in a diversity of cropping as part of their dairying venture. Oats, barley, maize, and cabbages are grown as feed for stock, and potato growing as a sideline fits into the pasture renewal programme.

Of particular interest is the growing of cabbages for fodder. These have been raised over the past twenty years from seed conserved on the property. Seed is sown in rows about 1 foot apart, in the open, in June. In early October, some 8,000 seedlings are planted out at the corners of squares with 2-ft. 6-in. sides to allow for easy cultivation in two directions at right angles to one another. One man can plant out about 2,000 seedlings in a day.

Feeding commences in January at the rate of one cabbage per cow per day. During this month, also, about a dozen of the better plants are selected and transplanted, and each of these yields about 1 lb. of winnowed seed twelve months later.

Unit Competitions

In accordance with a decision made early in 1952 at a meeting of the council of the Victorian Herd Improvement Association, a first prize is awarded in a herd-test unit in which there are three or more entries, and a second prize where there are five or more. Contests were held in six units only, as entries from other units came singly or in pairs.

Summary of Competition Results

(Herd-test units are indicated in brackets.)

State Champion—Mr. F. A. Reiter (Leongatha No. 4).

State Reserve Champion—Messrs. R. H. and L. J. Trease (Dumbalk North).

Winning Zone—Zone 9 (South-East Gippsland), the team comprising Mr. F. A. Reiter (Leongatha No. 4), Messrs. R. H. and L. J. Trease (Dumbalk North), Mr. C. Stockdale (Leongatha No. 4), and Mr. G. Trease (Dumbalk North).

Winners in each zone :—

Zone 1.—Mrs. B. McIlroy and Sons (Moyhu).
Zone 2.—Mr. E. R. Ennals (Cobram).
Zone 3.—Mr. W. H. Hamley (Pyramid-Calivil).
Zone 4.—Mr. L. L. Simkin (Paschendale No. 2).
Zone 5.—Mr. H. C. Savage (Heytesbury).
Zone 6.—Messrs. J. Lyness and Sons (Irrewillipe No. 2).
Zone 7.—Mr. M. Noble (Maffra-Sale No. 1).
Zone 8.—Mr. A. McLean (Warragul No. 2).
Zone 9.—Mr. F. A. Reiter (Leongatha No. 4).
Zone 10.—Mr. W. Papworth (Phillip Island).

Second in each zone :—

Zone 1.—Mr. R. J. Waters (Upper Murray No. 2).
Zone 2.—Mr. R. N. Browning (Yarroweyah No. 2).
Zone 3.—Messrs. J. English and Son (Kerang).
Zone 4.—Messrs. E. Wright and Son (Woodford No. 1).
Zone 5.—Mr. E. H. Podger (Chocolyn No. 1).
Zone 6.—Mr. J. J. Bubb (Ballarat).
Zone 7.—Mr. L. F. Nuttall (Yinnar No. 1).
Zone 8.—Mr. L. M. Johnson (Jindivick-Neerim No. 2).
Zone 9.—Messrs. R. H. and L. J. Trease (Dumbalk North).
Zone 10.—Mr. J. Gardiner (Phillip Island).

Winners in each section :—

Section A.—Farm Planning and Care of Equipment—Mrs. B. McIlroy and Sons (Mohyu) and Mr. G. Trease (Dumbalk North), equal.
Section B—Land Management.—Mr. F. A. Reiter (Leongatha No. 4).
Section C—Herd Management.—Messrs. R. H. and L. J. Trease (Dumbalk North).
Section D—Methods in the Dairy.—Mrs. B. McIlroy and Sons (Moyhu).
Section E—Use of Skim Milk (or Whey).—Mr. D. A. Dobson (Swanpool No. 1).
Section F—Bookkeeping and Business Management.—Mr. W. Papworth (Phillip Island).

Winners in unit competitions :—

Yinnar No. 2 (5 entries).—*First*—Mr. J. Walker; *second*—Mr. F. C. Bond.
Phillip Island (4 entries).—Mr. W. Papworth.
Boolarra No. 1 (3 entries).—Mr. W. A. Roy.
Katunga (3 entries).—Mr. E. D. Ford.
Rutherglen-Chiltern (3 entries).—Mr. L. Dawson.
Wodonga (3 entries).—Mr. C. Reid.

Entries for New Competition

Entries for the 1953 Dairy Production Improvement Competition close on June 30 next, but earlier entries would be appreciated. These can be made through herd-testing association secretaries or forwarded direct to the Secretary, Victorian Herd Improvement Association, Temple Court, 422 Collins-street, Melbourne, C.1.

Acknowledgments

The Victorian Herd Improvement Association and the Department of Agriculture owe their thanks to the following—Senior Dairy Supervisors, Dairy Supervisors, and other Departmental officers for their painstaking work in judging the competition; the Commonwealth Government which made prize money available through the Dairy Industry Improvement Grant; and the Commonwealth Fertilizers and Chemicals Ltd., donors of the challenge shield and the shield replicas presented to members of the winning team; the Royal Agricultural Society, donor of certificates to other prize winners.

The author also acknowledges, with appreciation, the assistance of Messrs. Edgoose and Flynn, Assistant Dairy Husbandry officers, who took part in the judging and supplied notes used in the writing of sections of this report.

Garden Notes for April

By GEORGE HYAM, Horticultural Supervisor

THE FLOWER GARDEN

Biennial Flowers can be Grown as Annuals

ON account of their normal habit of not flowering until their second season of growth, some attractive flowers are rather neglected in home gardens. In our climate, however, it is possible by sowing in the autumn to induce these plants to flower during their first season. Biennials, of course, die down after flowering in the same way as annuals, and will not persist past one flowering stage as perennial plants do.

The reason is probably that they make slow but steady growth through our relatively mild winters, this being more particularly root growth. When planted out in early spring, top growth then develops rapidly to the flowering stage.

All those biennials of which the seed is readily available here can be sown now in open seed-beds in drills and thinned out to a spacing of about 2 inches, or they can be pricked out in nursery rows at the same spacing, when in the two-leaved stage. If a frame is available, they can be brought on to a more advanced stage by August, the best planting time, though it is better not to cover them for the last three weeks before planting. Small lots can be raised in boxes kept in the open or under a frame, but, as fairly deep root systems should be encouraged, such boxes should be capable of holding a depth of not less than 4 inches of soil and the plants given a spacing of at least 2 inches to ensure their flowering the first season.

Some of the more attractive biennials include the true Canterbury Bells, some of which have blue shades only excelled by those of delphiniums; Chieranthus—the Siberian Wallflower—which has bright orange flowers, makes an excellent border and grows to a height of 15 inches; Dianthus, heddewiggi, or lacinatus, which might be described as single carnations and which have many tints. There is also a double strain of biennial dianthus and also a perennial variety which can be sown now for flowering next spring. Then there is the once popular Honesty, which has pleasing flowers but whose main attraction is the flat silvery seed pods which, when dried on the stems, make an "everlasting" decoration for keeping in vases without water. The Evening Primrose—Oenthera—is a tall plant growing to 4 feet in height and produces yellow, poppy-like flowers which are long-lasting when used as cut-flowers. Perhaps the choicest of all biennials are the Brompton stocks, which are usually considered to be the finest of that family. They will not flower until the following autumn or winter. Spring sowing is often advocated for these, but, sown in autumn, they will bloom earlier and better. Nice and Perfection stocks are also biennials, and these will flower in winter from summer sowing. Better flowers, however, are usually had from autumn sowings for planting out at the end of winter for flowering in spring.

Finally, there are the Sweet Williams, which are second only to phlox in their range of colours and even exceed phlox in the quantity of flowers they produce. These have been greatly improved of late, the Auricula strain having large florets in many colours. Sown now, they will flower early in spring and continue well into summer.

Autumn Sowing Best for Perennials

Seed catalogues feature many more species of perennial than biennial plants, most of which could be treated as annuals when sown either in spring or autumn, but most are only certain to flower to a worthwhile extent during their first season if they are sown in autumn under conditions similar to those suggested for biennials. The exceptions are those listed as "half-hardy," all of which are summer flowering and, therefore, can be sown in spring for flowering the same season. However, if these are started now and kept under the protection of a frame during the frost period, and judiciously cut back if their top-growth is excessive before the normal planting-out time, they too will flower more abundantly the first season. This applies to bedding begonias, calceolarias, mimulus, and salvias amongst others.

In addition to protection from frost, they need covering to avoid too wet and cold conditions during the winter. In the absence of frames, cloches over the bed or box will give the necessary protection.

A Point on Raising Larkspurs and Butterfly Delphiniums

Amongst the long list of annuals which can be sown now for spring display, or later for early summer flowering, Larkspurs and Butterfly Delphiniums have one peculiarity inasmuch as they both germinate better when sown when the weather is cool. Consequently, April or July sowing is best for them, although there will always be a low percentage of seed germinating if it is sown at other times usual for such seasonal flowers. From larkspurs and annual delphiniums raised in cool weather, better flowering can be expected, as the slower development of the plants seems to favour this.

Spring Bulbs which like Lime

April is the best time for planting late spring flowering bulbs such as tulips and hyacinths, and the corms of ranunculus and anemones in all parts of the State, except perhaps in the mountain districts, where March planting is quite suitable. One point that is often overlooked in relation to the growing of these species is that they all like a good lime content in the soil, preferably in the carbonate form which is best supplied by unburnt agricultural lime, applied a week or two before planting for preference.

Tulips need most, and in average soils 1 lb. per square yard would not be too much. For hyacinths, about half that quantity would suffice. A leading commercial raiser of the ranunculus and anenome considers that he has entirely eliminated trouble from the wilt that attacks these plants by the use of heavy dressings of lime. In any case, the flowers and corms produced after such heavy dressings suggest that the plants have a distinct preference for lime, but from the disease aspect good drainage is of equal importance.

Dutch growers of these plants also apply large quantities of calcium, usually in the form of chalk, or else plant on calcareous soils or marls.

THE VEGETABLE GARDEN

Harvesting Summer Vegetable Seeds from the Home Garden

Even in these days of high prices, the cost of the relatively small amounts of seed needed in the home garden is not great. The saving of seed, therefore, is more a matter of trying to build up or to perpetuate desirable strains by selection rather than a desire to save money. Still more important is to have the satisfaction of knowing that the seed is from a disease-free crop and not only from a clean individual plant. This should be the determining factor in deciding whether to save the seed or not, especially in relation to that of summer vegetables such as peas, beans, tomatoes, and cucurbits, all of which are subject to seed-borne diseases. This also applies to potato sets and most root vegetables; indeed, it is the safest rule to apply to all home seed production.

The strain is maintained and possibly improved by using only the seed of outstanding individual plants as seed parents which have been selected in regard to their yield, trueness to type, and freedom from any abnormality. Many commercial vegetable growers have built up their own strains which are superior to the average commercial lines by rigorous selection. The home gardener could, in the course of time, do the same or at least perpetuate the strain of any good crop. However, to haphazardly harvest the seed of unselected plants both from the diseases and strain angle, is never desirable nor likely to yield as good results as may be obtained from seed purchased from a reliable source.

So far as summer vegetables are concerned, the cucurbits are the only kinds likely to produce undesirable hybrids, as varieties of the various species will cross readily, and pure seed can only be relied on from crops isolated from other varieties by at least ¼ mile. The home gardener should not save the seed of these unless he is prepared to hand pollinate a few flowers and use the seed of fruits thus produced.

Sweet corn is unlikely to be hybridized unless quantities of maize are grown nearby, but second generation seed of a hybrid corn such as Golden Bantam Cross should not be used for sowing.

When to Harvest Seed

For the small lots needed for the home garden it is usually easy to harvest at the ideal stage, which is when the fruits, pods, or seed stems reach full maturity—just before the seed is shed or the fruits decay. Seed which has not reached full maturity can be of low germination. For commercial large-scale seed production, and especially if harvesting is done mechanically, it is necessary to harvest before the seed on the plants has quite reached this stage. Pod-bearing plants or seeds produced on long seed stems are cut or pulled intact, and the process of curing is continued by the sap still contained in harvested top-growth, so that when the foliage and stems become brittle dry the seed is mature and can be threshed. Tomato and cucurbit fruits are always allowed to fully ripen even in commercial practice.

The pods of peas and beans are mature when they are yellow and dry, and the leaves are yellowing and falling. Tomatoes should be allowed to get to the soft-ripe stage; melons and cucumbers should also be soft ripe, and the hard-rind pumpkins, squash, and marrows left on the vines until the stems of the fruits are completely withered. The seed-heads of lettuce should be left until the first signs of seed-shedding, or they can be cut off with some inches of stem attached just before this stage and allowed to completely ripen on a tray. Sweet corn cobs should be left on the plants until the stems and foliage dry off completely.

Extracting and Storing Home-harvested Seed

The threshing of small quantities of peas and beans, lettuce, or corn presents little difficulty. The dry trash can be removed by sieving to take out the small pieces. Fanning will usually remove the remainder, but threshing should only be done when the pods or stems are quite dry. In this stage, the seed separates by merely rubbing through the hands. Seed embedded in the pulp of tomatoes, capsicums, and cucurbits can be extracted by washing when the pulp is soft, but this will leave some pulp adhering to the seed, which is not of great importance for the home gardener nor will it affect germination if the seed is dried out in the sun on sheets of newspaper as is also necessary after the washing process.

All the pulp can be removed if desired by a fermentation process. This consists of scooping out the soft pulp containing the seed into a glass jar, then covering this with 3 or 4 inches of water. Stand the jar in some warm place and, in about 48 hours, a fermentation sets in and the pulp separates and rises to the surface, leaving the clean seed at the bottom; any seed that floats is usually non-germinable. Gently pouf off the water with the surface scum, tip out, and spread the seed on sheets of newspaper to dry.

Newly-threshed seed retains a considerable amount of moisture for some days unless it passes through a seed-cleaning machine which is fitted with an air-blast. It is advisable, therefore, to spread even apparently dry seed in thin layers on newspaper for a few days in a dry place before storing. When thoroughly dry, store in lidded jars or tins, but if moisture is present mould will set in. Lidded containers prevent undue absorption of moisture during humid weather, which can affect germination, but paper bags will suffice if they are kept in a dry place. Seed in store can be affected by insect attack, but this can be prevented by including a crystal or two of naphthalene or para-di-chloride of benzine (P.D.B.) in each small container.

Select Roots for Seed Production this Month

To produce good seed from onions, carrots, parsnips, beet, or turnips, it is essential that seed-bearing plants should be selected from lifted roots—their quality cannot be assessed from their top-growth. In all essentials, the selection is on the same lines as suggested for other seed plants.

The selected roots are then re-planted during the months of April to June and allowed to grow on. Seed stems will be produced in early spring and their seed will mature in the following January–February. One or two roots will produce ample seed for a home garden. They can be re-planted in any odd corner, but they will need much more space than that used for culinary roots; a seed-root will occupy at least a square yard of the garden. It should be re-planted with a good portion of the foliage left above the crown and at the original depth. Onion bulbs should be planted so that the neck is just above ground level and, of course, these will have no green foliage still attached.

Parsnip seed needs to be of the previous season's crop to germinate properly, and is, therefore, one of the kinds that might be regularly saved in home gardens to advantage.

Donor cars line the country road. The Red Cross Mobile Unit is in town today ! !

. . . "BLOOD ON WHEELS" . . .

A big silver van rolls along the country road—a silver van with big red crosses. Some people stand to stare ; to others it is now a familiar sight. It is the Mobile Blood Van of the Red Cross Transfusion service, specially equipped to take blood from country donors.

There are four mobile units in Australia, in New South Wales, Victoria, Western Australia and Queensland, differing from each other only in detail.

The vans are equipped to give full protection to the bleeding apparatus, stock beds for the donors, and in some cases supply refrigeration for the blood collected. Others have specially constructed ice-boxes for the bottles of blood. All equipment, bottles, and boxes are stored on shelves in the van. The Mobile Staff travel in a car or bus accompanying the van.

Almost everyone in Australia is familiar with the Blood Transfusion Services in the capital cities, but few people realise that every week these Mobile Units tour the countryside, stopping at centres large and small and ever widening the number of blood donors.

Some Units are "away from base" three days every week. The other two days they make short trips into the country. During the stay away, the Red Cross Workers (varying from nine to twenty) stay at local hotels or hostels. The team includes a doctor, driver, equipment officer, receptionist and aides. All the team are women, including the drivers of both vans and buses.

Red Cross Branches in the areas visited have three months' notice in which to prepare the ground. They notify the people in the surrounding areas through local press and film slides, arrange the use of the hall and provide couches, chairs, tables, ice for the blood, and refreshments for the donors. The Unit provides beds, screens and all equipment.

Average blood donation for a day at a small country centre is 70 to 80 pints, increasing to more than 100 pints at larger centres.

Where there is no Red Cross Branch in the area, contact is made through other bodies such as the C.W.A., R.S.S.A.I.L.A. and the Apex Club.

Most of the blood gathered in the country is processed for serum, partly because of the delay in getting it back to the cities, and partly because, for the most part, serum is used in country areas.

In some States, long visits to large centres are often undertaken. For instance, the New South Wales Transfusion Service makes regular visits to Canberra. This is a six-day trip and as many as 426 pints of blood have been collected on a visit.

Reasons for the Mobile Blood Scheme are to relieve the constant pressure on city donors to widen the contacts of the Blood Transfusion Service and to publicise the work of the Service in the country.

Although the number of blood donors throughout the Commonwealth has steadily increased over the years until it has reached 121,826 the need for this blood goes on increasing as medical science finds more and more value in whole blood and its by-products.

Mobile Units provide scope for widening the blood donor panel throughout Australia.

All this, of course, at a cost. Maintenance of the vehicles is heavy, and away from base expenses take more funds. Branches also have heavy costs. For instance, the Canberra Division estimated that the cost to them of a visit by the Mobile Blood Bank would be £200.

These services are vital to Australia and to you ! Can you help Red Cross to carry on the work of giving blood free to every hospital, doctor and institution in Australia. Can you give your blood—or can you give money to keep our services going?

Journal of the Department of Agriculture

VICTORIA

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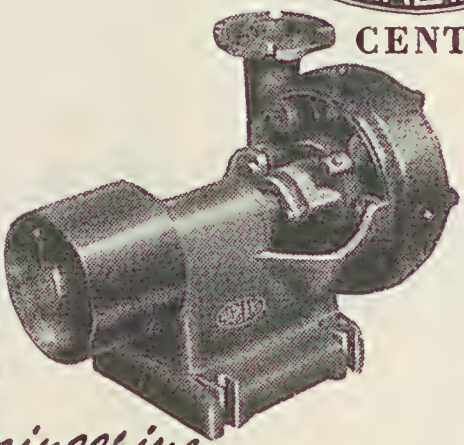

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SSB 3 in.	120-260	80
SSB 4 in.	220-500	80
SSB 5 in.	440-750	80
SSB 6 in.	600-1200	80
SSB 8 in.	800-1800	80
SSB 10 in.	1500-3000	80
SSC 1 in.	0-40	140
SSC 1½ in	30-100	140
SSC 2 in.	80-170	140
SSC 3 in.	150-300	140
SSC 4 in.	280-550	140
SSD 1½ in.	0-70	200
SSD 2 in.	60-140	200
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SSD 3 in.	140-300	200
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WHEAT CROP CHAMPIONSHIPS 1952

Wimmera, Mallee and Northern Districts

Twenty-five organizations, comprising agricultural societies and branches of the Victorian Wheat and Wool Growers' Association, competed in district wheat crop championships for the 1952-53 season.

Four championships were held—two in the Wimmera, one in the Mallee, and one in the Northern Districts. Fourteen societies competed in the Wimmera championships, four in the Mallee, and seven in the Northern Districts. In all, a total of 291 crops were exhibited.

The championships, which are conducted by the Farm Competitions Association of Victoria, are for the best 50 acres of wheat exhibited in local competitions held by affiliated organizations in the districts concerned.

In accordance with the rules, each of the championships is judged by an officer of the Department of Agriculture and the champion crop in each district is harvested under the supervision of a Departmental officer who certifies to the yield and area of the winning exhibit.

The Royal Agricultural Society of Victoria donates prize money of £50 for each championship and this was awarded on the basis of £25 to the grower of the champion crop and £15 and £10 to the societies nominating the first and second best crops in the finals. All prizes were presented at the annual conference of the Victorian Wheat and Wool Growers' Association held in Melbourne last month.

THE WIMMERA CHAMPIONSHIPS

Report of the Judges*:
H. J. SIMS, M.Agr.Sc., B.Com., Cerealist, and J. McC. McCANN, B.Agr.Sc., Agronomist.

Mr. Longmire's crop of Pinnacle, which yielded 64·3 bushels per acre, was tall, dense and well headed.

THE 1952 season proved an excellent one for wheat-growers throughout the Wimmera, and yields in many localities, particularly in the northern sections of the district, constituted local records. The season, however, was not without anxious times, particularly due to continued wet conditions throughout the winter months, which made sowing difficult and prolonged and severely tested the patience and ingenuity of farmers. On many farms, two tractors in tandem were used to pull one combine.

However, favorable weather conditions during the spring—prolonged cool weather with a moderate amount of wind—enabled crops to ripen satisfactorily. In fact crops scarcely looked back from seeding till harvest time and excellent yields—for the seventh successive season—were harvested.

Interest in crop competitions was well maintained during the year. In all, 185 crops were entered in local competitions in the Wimmera, compared with 160 in the previous year.

* Mr. Sims judged the Southern Wimmera Championship, and Mr. McCann, the Northern Wimmera.

Because of the wide variation in rainfall and soils, and particularly because of the greater inherent fertility of the black soils, the Wimmera district is divided into a southern and a northern zone, for purposes of crop championships. The dividing line between the two zones follows the southern boundaries of the Shires of Charlton, Donald, and Warracknabeal; then from the south-western corner of the Shire of Warracknabeal via the most direct road to Antwerp and Woorak and thence along the southern boundaries of the Parishes of Propodollah and Yanac-a-Yanac. The southern half of the parish of Rich Avon East is included in the Southern Zone.

SOUTHERN WIMMERA CHAMPIONSHIP

The champion crop in the Southern Wimmera was grown by Mr. M. L. Longmire of Drung. This crop of Pinnacle, which represented the Horsham Agricultural and Pastoral Society, returned a certified yield of 64·3 bushels per acre. It was rather tall, very dense and well headed, fairly true to type and reasonably free from weeds. The grain was bright and well filled, weighing 64½ lb. per bushel. In addition to its high yield, this crop showed very good quality characteristics: the protein content of the grain was 11·7 per cent. and the Pelshenke figure was 78 minutes.

The paddock history shows that the land on which this crop was grown has been cropped twice in the past four years on a fallow-wheat rotation. Prior to that, it had been used principally for grazing for many years.

Mr. Longmire, who is a soldier settler from the last war, prepared his fallow with a skeleton mouldboard plough in mid-July, 1951. It was disc-harrowed, harrowed and scarified during August, scarified in October and again in November, harrowed with shares attached in December and January, and scarified in March and May. It was sown with a combine with light harrows attached on July 15, with 89 lb. of mercury-pickled seed and 80 lb. of superphosphate per acre.

Second place was awarded to Messrs. Feeny Bros. of Swanwater, representing the Donald district. Their crop, although not as tall as the winning entry, was also a very dense, well headed, clean and even crop. The certified yield of this crop was 62·6 bushels per acre, with a grain weighing 64½ lb. per bushel and having a protein content of 12·2 per cent. The crop was grown on black ground, summer fallowed with a disc in April, 1951, scarified in May, twice in August, and again in October springtoothed in May (1952) and scarified later in the month. It was sown in June with 70 lb. of mercury-pickled seed and 90 lb. of superphosphate per acre. This land has only had two crops in about ten years, it being spelled in pasture which contained a strong growth of hairy burr-medic for two or three years after each cropping.

The crop placed third—that of Mr. H. E. Holland, representing the Dimboola Society—was also a very attractive crop of Pinnacle. This crop, which yielded in excess of 60 bushels per acre, was grown on heavy black soil worked for the past twelve years on a three-year rotation in which barrel medic was sown, and on which an excellent stand of medics grew during the pasture period. The land was not fallowed until October and was twice harrowed before harvest, share harrowed the first week in May and scarified the first week in July. It was sown on July 8th with 70 lb. of seed and 93 lb. of superphosphate plus 8 lb. of zinc sulphate per acre, and harrowed three days after sowing.

All the other entries in the championship final were of excellent standard: only one crop was expected to yield less than 50 bushels per acre.

The rotations adopted on the areas where the eleven championship entries were grown were generally longer than that practised by many farmers. The winning crop was grown on land that was mainly grazed until the past four years. In four entries the land had been out to grass for periods varying from two to seven years prior to the fallowing for the present crop. In several of these paddocks, the natural medics made good growth, particularly during the recent favorable seasons. A three course rotation was adopted in four cases, and in one of these, barrel medic had been sown to improve the soil fertility, while in two others, a good stand of hairy burr-medic grew during the last pasture period. The remaining two crops were grown on land that has generally been worked on a two course rotation with an occasional spell

LIST OF COMPETITORS—SOUTHERN WIMMERA CHAMPIONSHIP.

District Agricultural Society.	Representative in Championship.	Variety.	Certified Yield.
			Bus./ac.
Horsham	M. L. Longmire	Pinnacle	64·3
Donald	Feeny Bros.	Pinnacle	62·5
Dimboola	H. E. Holland	Pinnacle	..
Goroke	C. H. L. Crabtree	Quadrat	..
Kaniva	S. and D. Maddern	Magnet	..
Minyip	P. A. Krause and Niewand ..	Quadrat	..
Murtoa	A. A. Lutze and T. R. Petering	Pinnacle and Magnet ..	..
Natimuk	R. E. Smith	Pinnacle	..
Nhill	H. J. Creek	Quadrat	..
Rupanyup	R. F. Baker	Pinnacle	..
Warracknabeal	O. P. Pietsch and Sons	Pinnacle	..

The competitors representing the various districts are set out below. After the first three places, competitors are arranged in alphabetical order of districts.

NORTHERN WIMMERA CHAMPIONSHIP

Of the seven crops that competed for this championship, two were outstanding for yield although most of the others were estimated to yield at least 44 bushels per acre. A most extraordinary result was obtained, as when the two leading crops—at Charlton and Jeparit—were harvested under supervision, both returned a certified yield of 54·9 bushels per acre. This is a clear record yield for the Northern Wimmera championship, the previous record of 47.6 bushels per acre being established in 1951 by Messrs. B. and G. Kendall of Charlton.

Judging of the crop championship is carried out on the same scale of points as local crop competitions but, as crops with weaknesses are eliminated in the local competitions, crops competing for the championship normally are of a high standard and, if they cannot be separated on yield, their separation on other factors may not be an easy task.

After careful consideration of points allotted for purity and type, evenness and freedom from weeds and disease, the wheat crop championship for the Northern Wimmera for 1952 was awarded to Messrs. John Douglass and Sons of Buckrabanyule whose crop of Pinnacle represented the Charlton Agricultural and Pastoral Society. Thus the Charlton Society won the championship for the second time, and in successive years, in the four years of the competition.

This crop scored well for evenness and freedom from disease. Purity and type, although not perfect, were better than the runner up, while the degree of weed infestation was light in both crops. Other good features of the winning crop were a good grain sample with a bushel weight of 65·7 lb. and satisfactory quality characteristics. Also, in a severe windstorm on Christmas night, just after the crop was ripe, there

A young soldier settler, Mr. M. L. Longmire, above, won the Southern Wimmera Championship.

was a loss of grain, conservatively estimated at 3 bushels per acre. This of course was not included in the certified yield.

Buckrabanyule farmers, Messrs. John Douglass and Sons, in their crop of Pinnacle with which they won the Northern Wimmera Championship.

The crop was grown on chocolate soil which was cultivated more than the usual number of times in order to control rye grass. It was fallowed with a mouldboard in July, harrowed then scarified in August, harrowed in September, springtoothed in October and harrowed in November. After harvest it was scarified and harrowed twice before sowing in the first and second week in June with 70 lb. per acre of mercury-pickled seed and 90 lb. per acre of superphosphate. The normal rotation of the paddock in which the winning crop was grown is fallow, wheat, oats, natural pasture.

Mr. R. G. McIntosh, who won the Jeparit district competition came a very close second in the championship with an excellent crop of Quadrat. This crop was both dense and well-headed and was a tribute to the good heart of the land and the workmanship of the farmer. An outstanding feature of this crop was the fact that it was grown on Mallee land and the crop was as good on the gentle rises as on the flats. As a competition crop, it lost points for purity and type and for diseases including some loose smut, deadheads, and rust.

The land was fallowed with a plough in early August, scarified in late September and early November and received four workings after harvest. It was spring-toothed in February, scarified in March and worked again in early May and late June. Seeding took place in early July with 70 lb. per acre of copper carbonate-pickled seed and 65 lb. per acre of superphosphate.

The paddock is farmed on the three course rotation of fallow, wheat, natural pasture and in the pasture year carries a heavy crop of hairy burr-medic and other trefoils which no doubt assisted in maintaining fertility and contributed to the grain protein of 11·3 per cent. in the 1952 crop.

The following wheatgrowers represented their respective districts in the final judging for the championship.

WIMMERA WHEAT YIELDS

Wheat crops in the Wimmera over the past five years have given higher yields than in any other quinquennial period. Certainly a major factor in these high yields has been the run of favorable seasons, but the skill and efficiency of the farmers has played an important part. For many years farmers have been ready and willing to co-operate with the scientist, and their joint efforts, combined with favorable seasonal conditions, have made possible this high level of production.

LIST OF COMPETITORS—NORTHERN WIMMERA CHAMPIONSHIP.

District Agricultural Society.	Representative in Championship.	Variety.	Certified Yield
			Bus./ac.
Charlton	John Douglass and Sons ..	Pinnacle	54·9
Jeparit	R. G. McIntosh	Quadrat	54·9
Boort	Alex Poxon and Sons	Quadrat	..
Dimboola	H. A. Lehmann	Pinnacle	..
Donald	R. W. Newell	Quadrat	..
Nhill	J. Colbert	Pinnacle	..
Warracknabeal	R. Lehmann	Pinnacle	..

The widespread use of improved wheat varieties of high yielding capacity has been an important factor in these yields. Last year, 97½ per cent. of the Wimmera acreage was sown with the four varieties, Quadrat, Pinnacle, Insignia, and Magnet. Experimental results indicate that the yielding capacity of these varieties is 10 to 15 per cent. higher than the varieties grown twenty years ago.

Mr. C. Douglass harvesting the Northern Wimmera Championship crop —yield, 54·9 bushels per acre.

Another factor is the widespread use of tractors and power farming which have enabled farmers to speed up their work and take maximum advantage of the favorable opportunities that are presented for cultivating the fallows and sowing the crops. With power farming, not only can larger areas be worked in a given time, but it is possible to work very much longer hours than was possible with horses. In wet seasons, this can have very important time-of-sowing effects.

Wimmera farmers recognize that early fallow and thorough tillage are essential in the production of high-yielding crops. The black soils have a large capacity to conserve moisture, and the control of weeds is of prime importance in reducing moisture losses from fallows.

The high yields harvested in the past seasons indicate that the soils of the Wimmera, generally speaking, are still in "good heart." It says much for the natural fertility of these soils that on many farms average yields of over 40 bushels per acre are still being harvested, despite intensive cropping over a long period.

Spelling the land under natural pasture for a year or two, as is often practised, assists in maintaining the physical condition of the soil, but it does not contribute much to the actual build-up of nitrogen in the soil unless clovers or trefoils are present. Soil nitrogen content is important in the growing of well-stooled healthy crops, and also in the production of grain with a good gluten content, and is a very important aspect of soil fertility.

In the higher rainfall districts, soil fertility has been greatly improved by spelling the land under subterranean clover, but, in districts with less than 18 inches annual rainfall—which includes practically all the wheat belt—one problem is to obtain suitable legume species. On some occasions, legumes such as hairy burr-medic, burr trefoil, woolly and cluster clovers occur naturally and perform a very useful service. Most promise, however, has been given by barrel medic, and it is considered that, where land is being spelled under pasture, the sowing of this species will give an improved pasture and also provide a quicker improvement in soil fertility than is practicable with natural medics.

Messrs. Feeny Bros., Donald, loading a bulk truck with a grain auger from the header, and with a bag loader. Their crop of Pinnacle, which yielded 62·6 bushels per acre, was second in the Southern Wimmera Championship.

More experimental work on various aspects of this problem is required, and work has been commenced at Longerenong College

A dense, well-headed crop of Quadrat which yielded 54·9 bushels per acre, gained second place in the Northern Wimmera Championship for Mr. R. G. McIntosh, Jeparit.

to see how barrel medic may be used in various rotational systems to improve soil fertility and hence the yield and quality of wheat.

WHEAT VARIETIES

An important aspect of crop competitions is the opportunity given for Departmental officers to see the performance of the various varieties under a wide range of conditions, and the publicity given to varieties plays an important part in familiarizing farmers with varieties of wheat which gave the best returns. New wheats, are, of course, thoroughly tested in experimental plots by the Department of Agriculture before being named or recommended for growing in any district, but many farmers are interested to see the performance of such varieties in bulk areas before accepting them.

Wheat varieties recommended for Wimmera sowings are Pinnacle, Quadrat, and Magnet for the black soils, and Pinnacle, Quadrat, Diadem and Insignia for the red and fringe soils. These recommendations are based on evidence extending over a period of years and at a number of centres and constitute the most reliable basis for varietal recommendations. The performance of named varieties in Wimmera plots over a period of years is shown in the table hereunder.

The variety which gave best results last year in experimental plots and in crop competitions was Pinnacle. In the experimental plots, however, it was outyielded by one or another of the new crossbreds being tested. The best of these crossbreds (Baldmin x Quadrat) offer promise as wheats for the future, but they still require further testing over a period of years for yielding ability, and to ensure that their baking quality, disease resistance and agronomic characters are of a satisfactory standard.

In the crop competitions, Pinnacle was grown on 49·5 per cent. of the competition crops (see Table next page). It was placed first in six competitions and comprised the major portion of another winning entry in the Southern Wimmera, and won four of the seven competitions in the Northern Wimmera.

Pinnacle has an additional advantage of producing flour of a better quality than Quadrat or Magnet, and for this reason, also, Pinnacle should be increased in acreage. It should be remembered, however, that, while Pinnacle can be relied on for heavy yields under favorable conditions, its ability

WHEAT VARIETY TRIALS IN THE WIMMERA.

Variety.	Longerenong Average 10 years, 1943–1952.	Salisbury Average 10 years, 1943–1952.	Kaniva Average 10 years, 1943–1952.	Charlton Average 5 years, 1948–52.	Warracknabeal Average 5 years, 1948–52.	Donald Average 4 years, 1948–1950 and 1952.
Pinnacle ..	44·2	37·7	47·9	42·0	40·1	39·4
Quadrat ..	43·4	37·9	45·2	43·1	38·6	36·8
Magnet	40·5	37·1	46·7	40·0	39·0	39·1
Insignia	42·3	37·0	41·7	42·4	35·8	39·0
Diadem ..	40·6	33·9	41·7	37·0	36·5	37·2
Javelin	..	..	..	36·5	33·5	33·5
Gabo	..	..	..	33·7	29·4	32·2

to contend with difficult conditions of soil or rainfall is not as good as that shown by Quadrat or Insignia.

Quadrat has been the most widely grown wheat in the Wimmera for several years. Last year it was sown on only a slightly larger acreage than Pinnacle. Quadrat is a more widely adaptable wheat than Pinnacle, and its field characteristics appeal to growers. Its baking quality, however, although at least equal to the varieties it replaced, is below that desired by millers and bakers.

Insignia is now the most widely grown variety in the State, and has proved particularly popular in Mallee districts. It has given very satisfactory yields on the red and fringe soils of the Wimmera and has proved the best of the early maturing varieties where such a variety is required.

Previous Championship Winners.

The winners of Wimmera championships since the inception of the competitions are set out in the table in the column opposite.

Wimmera Wheat Crop Championships.
Winners 1938–1952.

Year.	Winner.	Agricultural Society.	Variety.	Certified Yield.
				bus./ac.
1938	H. Cramer ..	Nhill ..	Ghurka	32·5
1939	L. H. Clark ..	Nhill ..	Ghurka	49·3
1940	C. P. Dahlenburg	Nhill ..	Ghurka	35·1
1941	V. H. Baldock	Kaniva	Magnet	45·7
1946	C. H. Champness	Kaniva	Quadrat and Magnet	53·8
1947	H. F. Budde ..	Dimboola	Quadrat	46·1
1948	W. E. Dahlenburg	Horsham	Pinnacle	68·5
	Southern Wimmera Wheat Crop Championship.			
1949	W. E. Dahlenburg	Horsham	Pinnacle	68·0
1950	A. G. Mock ..	Kaniva	Magnet	43·0
1951	D. J. Dunlop ..	Rupanyup	Pinnacle	54·3
1952	M. L. Longmire	Horsham	Pinnacle	64·3
	Northern Wimmera Wheat Crop Championship.			
1949	E. C. Rethus ..	Nhill ..	Pinnacle	47·0
1950	W. G. Rodda ..	Jeparit	Pinnacle	40·2
1951	B. and G. Kendall	Charlton	Insignia	47·6
1952	J. Douglass and Sons	Charlton	Pinnacle	54·9

Number of Crops of Each Variety Sown in Local Competitions in the Wimmera, 1952.

District.	Pinnacle.	Quadrat.	Insignia.	Magnet.	Ghurka.	Koorda.	Total.
Boort	..	4	2	..	..	..	6
Charlton	2½	2	5	..	..	½	10
Dimboola	13	..	1	6	..	..	20
Donald	7	2	1	..	..	..	10
Goroke	1	2	..	2	1	..	6
Horsham	4½	1	½	..	..	..	6
Jeparit	6½	8½	5	2	..	..	22
Kaniva	2	2½	..	7½	..	..	12
Minyip	7½	5½	..	..	..	..	13
Murtoa	7½	4	..	½	..	..	12
Natimuk	6	1	..	..	..	..	7
Nhill	16	7	6	3	..	..	32
Rupanyup	10	3	..	..	..	..	13
Warracknabeal	8	7	1	..	..	..	16
Total	91½	49½	21½	21	1	½	185

(continued on page 180.)

THE DAIRY FARM

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Sources of Credit for Dairy-farmers.

FREQUENT inquiries regarding capital advances and short-term credit are received by the Department from farmers and intending farmers. The following notes on some of the financial institutions dealing in this class of business may, therefore, be of interest.

1. Rural Finance Corporation

The Rural Finance Corporation was constituted by the Victorian Government for the purpose of creating effective credit facilities for the establishment, development, and general assistance of primary and secondary industries in rural areas. Loans are available where the investment is outside the metropolitan area which, generally speaking, is 13 miles from the G.P.O., Melbourne. Finance may be obtained for the purchase of a property and for practically every farm improvement, including the purchase of stock and machinery. A concession rate of interest is allowed to farmers who carry out improvements to their milking sheds where the Department of Agriculture certifies that these improvements are required under the Milk and Dairy Supervision Act.

In general, the period for the repayment of a loan is varied according to circumstances, and may be up to ten years in any one term. Where the loan is for a considerable amount and satisfactory repayments have been made, it is usually extended for further ten-year periods. The borrower, in addition to paying interest, is obliged to make some annual repayment of principal. Loans in respect of farming properties are almost invariably made against the security of land but, in the case of small loans for farm improvements, stock mortgages or cream assignments are sometimes taken.

If a person intending to purchase a property requires finance from the Corporation, he must first have a contract or a written option to buy the land. It is advisable for a prospective borrower to state in the contract that the purchase is subject to the availability of finance. The Rural Finance Corporation Act provides that the institution may lend up to 90 per cent. of a property's value and, before any loan is granted, the land offered as security is inspected and valued by a Corporation valuer.

Forms on which to apply for loans are available from the General Manager, Rural Finance Corporation, 107 Russell-street, Melbourne, C.1.

2. Banks

Banks where credit may be obtained include the Commonwealth Bank, the State Savings Bank, and the trading banks.

Loans for fixed periods are normally available from the Commonwealth and State Savings Banks, whilst the trading banks usually deal in overdraft loans. As a rule, separate loans are not made available by banks for the purchase of stock or machinery. When a loan is required for the purchase of a property, the bank puts its own valuation on the farm and bases the amount of the loan on this figure.

3. Insurance and Assurance Companies

Life assurance companies are the main lending bodies in the above category. Most companies make loans on land and fixed improvements but do not lend solely on stock and machinery.

4. Stock and Station Agents

Several stock and station firms make loans available for the purchase of dairy stock. The security for these loans are the cattle themselves. The security is, in other words, a stock mortgage.

[K. Flynn.]

Dairy Sterilizing Cabinet

Despite the efforts of dairy farmers to produce an article which is clean, fresh, and palatable, their product is apt to be graded down occasionally on arrival at the factory. The causes of lowered quality are numerous, but one check made during the summer showed that about four-fifths of cream graded down by factories was spoiled, in the first instance, by careless washing of dairy equipment. In many cases, the equipment was cleanly washed but not scalded. Thus, it remained damp, often until the next time it was used, and this dampness favoured the multiplication of bacteria.

Proved Method of Cleansing

The following well-tried method of cleansing dairy equipment still remains the best :—

1. Rinse the equipment in lukewarm or cold water to remove the "milkiness".

2. Wash and scrub the equipment in hot water, using a solvent such as washing soda or soda ash and a scrubbing brush to remove "greasiness". Cloths should not be used as these tend to become cheesy and rank smelling. In the cleaning of milking machines, boiling caustic soda solution is used at this stage.

3. Finally, the equipment should be immersed in boiling water or subjected to live steam for a few minutes to sterilize it. This final heating also causes the utensils to dry rapidly when placed on the storage racks.

A problem is presented in the handling of the smaller parts of the separator after they have been thus intensely heated. This has been overcome by many farmers in North-Eastern Victoria by the use of a sterilization and storage cabinet. This form of sterilization, however, is possible only where "live" steam is available.

Design of Cabinet

The cabinet is usually built into the division wall between the separator-room and wash-room, and has a door on each side so that the equipment can be put into it directly from the wash-trough and can later be taken directly into the separator-room for assembly and use.

For a cabinet of convenient size, a hole 3 feet square is cut in the division wall between the two rooms. Into this opening a cabinet is built of 1-in. kiln-dried hardwood 20 inches wide, that is, wide enough to accommodate milk or cream cans. It is lined with galvanized sheet or masonite, and a sliding door of full width and height is placed on each side of the cabinet. The inside measurements of the cabinet are 2 ft. 10 in. x 2 ft. 10 in. x 1 ft. 9 in. The floor of the cabinet is sloped slightly to the wash-room to allow for drainage of water which condenses in the cabinet. If galvanized sheet iron is used this should be 6 ft. x 3 ft., as this size will allow a 1-in. wrap at all edges. To obviate rust it is secured with brass or copper tacks.

Six holes, $\frac{1}{4}$ inch in diameter, are bored in the roof of the cabinet—these must be on the wash-room side—to allow the escape of steam.

Two racks made of $\frac{1}{2}$-in. galvanized iron piping are placed in the cabinet at heights 3 inches and 15 inches from the bottom, respectively. These are readily detachable so that they can be removed when cream cans and other large articles are to be steamed.

The steam pipe is brought from the boiler along the wall and let into the bottom of the cabinet, and a convenient stop cock is fitted close to the cabinet. Where a copper is used, the steam can be collected by means of a domed cover over it, with a $\frac{1}{2}$-in. outlet at the centre connected to the cabinet with a piece of $\frac{3}{4}$-in. hose.

Advantages of the Sterilizing Cabinet

Complete sterilization is ensured when this simple and convenient method is used and the steam supply is adequate. Moreover, the equipment can be left in the

cabinet and steamed for a much longer period than would be possible with other methods. However, when steaming is completed, both doors should be opened to allow a free circulation of air.

Once the smaller items of equipment have been placed on the racks in the cabinet, they need not be moved again until they are to be assembled for use at the next milking; therefore, they do not have to be handled while hot.

Adequate steaming destroys bacteria and also prevents the rusting of tinware by ensuring that utensils will be effectively dried.

[H. A. Henry, Senior Dairy Supervisor.]

The Young Farmer

The announcement that yet another young dairy farmer is fortunate enough to be going abroad shortly, renders this an opportune time to consider how one can best get full value out of any tour of farms and agricultural institutes, whether abroad or in Australia. If, for instance, you are attending a farm field day even in your own district, or visiting the farm of a competition winner, how can you derive most benefit from your visit?

Attaching New Knowledge to Old

We retain new knowledge mainly by attaching it, as it were, to something we know already; therefore, you must obviously know something about dairying if you are to gain much from a visit to a dairy farm. But there are further ways of assisting the process of attaching new knowledge to old.

One way is to go with some question in your mind for specific investigation. Such a question could be, "How does this farmer go about maintaining soil fertility?" The inquiry into this wide question would lead you to many interesting discoveries about the farming system you are investigating.

Another method is to ask—what are the similarities between the methods examined and your own; do they arise from any basic principle of agriculture; or, in both cases, merely from custom? Even more instructive would be an inquiry into the differences observed in farming methods. Are these due to climate, population density, demands of local markets, topography of the farm itself, tradition, or some other cause?

The real test as to whether you have gained much from a tour is your ability to explain your experiences and impressions to others on your return. The attempt to do this is apt to find you with some vague ideas which you thought were clear.

Sterilizing cabinet used by Mr. F. Scholes, Benalla. The cabinet, which is constructed of masonite, has been in use for over five years.

The Camera as an Aid to Memory

A camera is a valuable aid to memory if it is wisely used and photographs are taken with a definite purpose; the pictures, especially if projected on a screen, are very helpful when you come to share your experiences with others.

"Miniature" cameras using 35-millimetre film have some advantages over the larger types. Film is cheaper and many exposures can be taken before reloading. Moreover, colour film, which is sometimes desirable in such work, can be made directly into slides of this size. Organizations which are periodically sending members abroad might well consider obtaining such a camera to lend to them for the duration of each trip.

[K. M. Sillcock.]

THE FRUIT FLY CAMPAIGN

By F. M. READ, M.Agr.Sc., Superintendent of Horticulture

ALTHOUGH Queensland Fruit Fly (*Dacus Tryoni*) has been present in the sparsely populated eastern extremity of Victoria for some years, its occurrence in fruit of one Gravenstein apple tree in the Melbourne suburb of Surrey Hills in January of this year was the first record in any other part of Victoria.

Immediate examination of several hundred gardens within a mile radius of the occurrence failed to disclose further evidence of its presence, but it was decided nevertheless that, in view of the nature of this pest, one of the worst of fruit pests, and the proximity of important fruit-growing areas to Melbourne, vigorous steps should be taken to eradicate it. The measures decided upon conform generally to those which have been adopted successfully at Sale, in East Gippsland and in Adelaide, in recent years.

PUBLIC CO-OPERATION

The occurrence was wisely given great publicity by the daily papers, and this resulted in a remarkable community effort in which it would seem most Melbourne citizens for a time were on the lookout for evidence of fruit fly throughout the metropolitan area and, indeed, throughout the State. Several thousand telephone calls were answered by officers of the Department. Many hundreds of properties, excluding

A fruit-stripping team with bagged fruit being loaded into the tip-truck from a suburban property. It will go to the quarry for disposal.

those in proclaimed areas were visited, and some two thousand specimens of suspected fruit fly submitted by the citizens of Melbourne and many country areas were examined.

Within a fortnight as a result of this intensive search, fruit fly was identified in five other suburban gardens, one in Box Hill, two in Toorak, one in East St. Kilda, and one in Beaumaris. The fruits concerned were nectarines and peaches, except in the Box Hill and Beaumaris cases, where adult flies were found in the houses and were considered to have originated in apricots grown in the gardens of these properties. Residents recalled having seen maggots prior to the press publicity. Of these cases all were Queensland Fruit Fly, except that at Beaumaris which was identified as Mediterranean Fruit Fly (*Ceratitis capitata*). In all cases, as at Surrey Hills, only a single tree was affected and these trees were separated by a distance of two or more miles, except the two infested trees in Toorak, which were about one-third of a mile apart.

After the lapse of a month, during which, despite the continued active search by householders and the Department of Agriculture, no further cases of fruit fly were detected, three occurrences in apples were recorded in mid-March, one in Hawthorn and two about three hundred yards apart in Windsor. These cases, like the others, were isolated, single-tree infestations.

As these notes are being written the possibility of further occurrences in late fruits is appreciated.

The only country case brought to light by this intensive search was at Longwood, a small township about 90 miles north of Melbourne on the Hume Highway. There are two commercial orchards separated by a distance of about a mile at Longwood and about a score of widely-spread farm homesteads. Fruit fly occurred in nectarines on one orchard, but no evidence of its presence has been detected on the other properties.

ACTION UNDER PROCLAMATION

Under the provisions of the Vegetation Diseases (Fruit Fly) Act an area around each point of infestation was proclaimed. In the suburbs a proclaimed area embraces all land within a mile of the point of infestation. Within this area the planting of tomato, pepper, egg plant, ornamental solanum, rock melon, sweet melon, cucumber, and cape gooseberry is prohibited. The removal of fruit from the proclaimed area or from any property within it to any other property is also prohibited. Blackberries must be eradicated and boxthorn must be either eradicated or prevented from fruiting by cutting back and spraying with the chemical 2,4,D.

Upon the service of a notice by an inspector, residents are required to strip all host trees and plants of their fruits and to pick up all "windfalls." The proclamation provides that such fruit must be destroyed by boiling or burning or by burying under at least three feet of soil after treatment with D.D.T. Actually this stripping and disposal of fruit has been carried out, on behalf of householders, by teams employed by the Department of Agriculture. During the fruit stripping, prohibited plants are also removed and disposed of. Householders, however, are required, after this initial stripping, to keep their gardens free of fruits and prohibited plants during the time the procla-

mation remains in force. This means that, in the case of such fruits as lemons and figs which are continually producing new fruits, they must remove them as they form. They are also requested to prune rose bushes in such a way as to prevent the formation of rose hips and other fruits (in the botanical sense) which occur on ornamental plants from time to time as these, in the absence of the edible fruits, might be used as an alternative by the fruit fly.

Immediately fruit fly is detected, the soil around infested trees is treated with D.D.T. to destroy pupae and prevent the emergence of further flies. Lure pots are placed in trees at intervals throughout the proclaimed area as a source of information as to the presence of flies. In the suburban areas, however, only two flies—one, a Queensland Fruit Fly, near the Surrey Hills infested tree, and the other a Mediterranean Fruit Fly near the Beaumaris outbreak—have been caught.

Left—Pickers of the fruit-stripping team collect all fruits and vegetables, such as tomatoes, capable of harboring fruit fly eggs and larvae.

Right—Some 48 power-spray units, and several teams equipped with knapsack sprays, treat all foliage with DDT and tartar emetic baits throughout the proclaimed areas.

The method of disposal adopted has been to place the fruit in a deep quarry and, after applying to its upper layer D.D.T. dust equivalent to not less than ½ oz. per square yard of actual D.D.T., to cover the fruit with not less than three feet of consolidated soil.

Only the central part of the proclaimed area embracing properties within half a mile of the point of infestation have been required to be stripped. The purpose of this stripping is firstly to dispose of any other fruit in the vicinity of the occurrence which might already be infested, though undetected, and secondly to remove all suitable fruits in which the fly or flies responsible for the observed outbreak could lay further eggs during their lifetime, which may be up to several months.

SPRAYING WITH D.D.T. AND POISON BAITS

All of the gardens in the suburban proclaimed areas are also sprayed by Departmental teams on behalf of householders. As there are probably about 40,000 properties included in the proclaimed areas, the organization of this spraying work was no light task. It involved the hiring of 48 trucks on which were mounted power spraying machines loaned by or hired from orchardists in the districts nearer to Melbourne.

The first spray applied very rapidly, and immediately upon the detection of a new occurrence of fruit fly is a poison bait of tartar emetic and sugar. These baits are sprayed here and there in gardens within a quarter to half a mile of the

Left—Fruit in bags as taken from suburban gardens being tipped into a deep quarry to be treated with DDT and covered with three feet of soil.

Right—The front-end loader on the floor of the quarry spreading the fruit before treatment and covering with soil. It also consolidates the mass thoroughly.

infestation in the hope that flies may be attracted to them and poisoned. A good deal of this work is carried out by men working on foot using knapsack sprays.

In addition, all gardens will be sprayed by power spray with 0·2 per cent. D.D.T. at three-weekly intervals up to the end of April.

The purpose of the D.D.T. spraying over this protracted period is to kill the adult fly by contact as it moves from tree to tree or plant to plant in its search for fruit in which its eggs may be laid.

At Longwood, both commercial orchards and all other fruit trees within a mile of the infestation have been stripped and sprayed, on a similar plan to that described above, by the orchardists under the supervision of the Department.

Where persons whose fruit has been stripped feel that they have suffered a loss they may claim for compensation after obtaining the appropriate form from the Department.

INSPECTION OF FRUIT COMING INTO VICTORIA

The inspection of fruit coming into Victoria commercially from the northern States has, for many years, been very stringent, involving inspection of each individual fruit and the repacking of all consignments from districts where fruit fly occurs. The recent and prospective further speeding up of interstate railway schedules for goods trains on which fruit is carried is reducing the time between fruit picking in the northern States and inspection in Victoria. Thus fruit tends to reach us when the insect is in an earlier stage of development and consequently more difficult to detect. Much thought has been given by the inspection staff to this problem but it is possible that affected fruit in an early stage of attack may slip through occasionally. It is the responsibility of wholesale and retail merchants and the public to watch for any sign of such infestation and report it. It is however striking that, in fact, at no time, either during this campaign or previously, has infested commercial fruit been brought to the notice of the Department.

A more probable source of infestation is thought to be fruit brought in privately by travellers and, although the Department has, for some years, been giving publicity through posters, wireless statements, and the press to fruit fly, to draw the attention of travellers to this risk, the valuable press publicity given throughout the campaign will unquestionably assist very greatly in bringing home to travellers the good reasons why they should not bring fruit from northern States into Victoria.

(continued on page 162.)

Establishment and Improvement of a Dairy Herd

I. HOW TO BUY A HERD

By T. N. EDEY, M.Agr.Sc., Assistant Supervisor of Herd Testing

Many difficulties attend the purchase of dairy stock to make up a new herd. Ill-advised purchases may leave the new dairy-farmer with a foundation herd low in production, riddled with disease, and difficult to handle in the shed. This will result in low returns in the early years when good returns are needed most. From such a beginning, herd improvement by breeding or further purchases is slow and costly. In this series of articles, the relative merits of the various sources of dairy stock will be discussed.

Where investigation has shown that herd performance and health are satisfactory, it is good practice to buy a herd as a going concern.

BEFORE commencing a search for stock, a decision must be made as to which breed is wanted. This will be determined by the product required (milk or butterfat), the conditions under which the stock will be run, personal preference, and the availability of stock of the various breeds.

In general, low-testing, heavy-milking breeds are more profitable where milk is paid for on a gallonage basis but, when payment is made on butterfat content, high-testing breeds are more profitable. Further, the size and weight of the animals should be considered in relation to the type of country, for it is probable that lighter animals are at an advantage on steep country and where the soil is disposed to pugging. There is no "best breed" for all conditions, but the availability of high-producing stock of different breeds varies considerably and must be taken into account when a selection of the preferred breed is being made. It is a distinct advantage

A line of heifers known to be bred from high-producing stock make a good nucleus for a new herd.

if such stock can be obtained locally, for not only will they be adapted to local conditions, but more careful inspection can then be made, resulting in a better assessment of their worth.

When buying stock, the desired age composition of the new herd must be kept in mind. A herd of heifers would probably give relative freedom from disease and the promise of long herd life, but these young animals would be untested for production and, further, total production in the first two years would, because of their immaturity, be lower than that of a herd containing a normal complement of mature cows having equivalent dairy ability. It is probably best to have something approaching normal herd age composition, containing at least 50 per cent. mature cows.

The buyer who can take his time in building up a herd is fortunate. Not only can he be more selective in his purchases, but frequently he can save money by buying stock two or three months before calving. At this stage, they can usually be bought considerably cheaper than within a few days of calving.

Information Required

Having decided on the desired breed and age composition of the herd, buying can proceed, but before purchasing any stock, it is important to have information concerning—

1. production records of cows or production backing of heifers;
2. age of stock;
3. calving date;
4. freedom from disease, particularly mastitis, abortion, and tuberculosis.

Production Records

1. When buying cows, it is sound economy to study any available production records and, if possible, to buy only tested cows. Dairymen commonly pay for a cow about two-thirds of what the cow will produce in her first year in the herd. At current butterfat prices, a cow bought for £40, which produces 300 lb. butterfat, yields a profit in the first year, whereas if she produces only 200 lb. butterfat she will show no profit until her second season, and she may die or be culled before then.

Heifers should be bought on the production records of their dam and the butterfat backing of their sire. The buyer is fortunate if he can obtain a line of heifers from a high-producing herd and a sire of proven merit.

Age

2. It is important to know the age of any cow purchased, as this will indicate her expected productive life. Two-year-olds have the longest expected productive life, but, if selected carelessly, may prove unproductive, infertile, or of unsatisfactory temperament.

Heifers are usually less costly than second and third-calf animals, which are the most valuable dairy stock, particularly when selected on their previous production records. Such cows are approaching peak production and have a long expected herd life. A considerably lower price should be paid for fourth and fifth calvers, while aged cows must be bought with an eye to their carcass value and breeding worth.

Calving Date

3. Definite information as to whether a purchased cow is empty or in calf is essential.

It is advantageous to know accurately her expected calving date, particularly under seasonal dairying conditions where out-of-season calvers are undesirable.

Freedom from Disease

4. The new dairyman should make every effort to commence with a herd free of disease, particularly mastitis, contagious abortion, and tuberculosis. Freedom from mastitis is difficult to ensure, but handling and close inspection of the udders of stock before buying, and inquiry concerning their past history will help. Contagious abortion can be largely avoided by buying "Strain 19" vaccinated stock, or vaccinating untreated stock before placing them in the herd. The purchase of T.B. tested stock may be more difficult, but as larger areas of Victoria become T.B. free, more T.B.-tested stock will become available.

Sources of Dairy Stock

The main sources of stock are :—

1. A herd as a going concern.
2. Clearing sales.
3. Saleyards.
4. Private purchase on a farm.
5. Calves.

A Going Concern

1. Provided adequate production records are available and the stock are in good health, the purchase of a herd as a going concern may be most satisfactory. Before any purchase is made, however, reliable calving data should be available, the whole herd examined, and feeding and management conditions under which production records were compiled, inspected. Opportunities to buy a productive herd as a going concern are relatively rare and, more commonly, stock must be accumulated from several different sources.

Clearing Sales

2. Genuine clearing sales are probably the best source of dairy stock. Such sales are advertised well in advance, giving ample time to obtain full information concerning the stock offered. The opportunity exists for a thorough inspection of the animals; their production records; feeding and management conditions. Further, the cattle are not subjected to the stresses commonly associated with transporting and holding at saleyards.

Saleyards

3. Public saleyards, in general, are a poor source of sound, productive dairy stock. Most mature stock sold through this channel have been culled from other farmers' herds because of low production, infertility, disease, or bad dairy temperament. Usually, little information is available concerning previous production records, disease, or calving date of cows offered.

The astute buyer occasionally will make a sound purchase, but only rarely can a genuine line of worthwhile dairy cattle be obtained from this source. Buyers should remember that the conditions of sale provide a guarantee concerning only the pedigree and description of cattle offered and, to be binding, guarantees concerning health, age, calving date, and previous production should be signed by the vendor or the auctioneer acting as his agent.

Private Purchase

4. To buy privately on a farm is a good way to obtain lines of dairy heifers. It is a method which has many of the same advantages as clearing sales. However,

In general, the saleyard is an unsatisfactory source of dairy stock.

When buying dairy cattle it is essential to study the conditions under which the stock were reared and milked.

the buyer should obtain definite information concerning butterfat backing, calving dates, and whether or not the heifers have been vaccinated for contagious abortion. This information is more likely to be obtained from a dairy-farmer who has reared a few surplus calves than from a dealer who may have accumulated stock of unknown quality from a range of sources.

Purchase of Calves

5. When a buyer is in a position to buy stock and hold them for some time before bringing them into milk, the purchase of calves may be practicable. It is sometimes possible to obtain and rear well-bred surplus calves from neighbouring dairy farms, and this is quite a satisfactory method of building up a herd. Its application is, however, rather limited.

Conclusion

Herd-building by purchase is difficult at present owing to the keen demand for dairy stock. Factors to consider when buying dairy cattle and the relative merits of various sources of stock have been discussed. Although it is unlikely that these principles can be followed by purchasers in all cases, they should serve as a useful guide, particularly to dairymen setting up a herd for the first time.

Further instalments in this series of articles, "Establishment and Improvement of a Dairy Herd," will be published in subsequent issues of the Journal.

FRUIT FLY CAMPAIGN—(*continued from page 158*)

The distribution of posters and folders on fruit fly is being continued and road signs have been placed, in co-operation with the Country Roads Board, along the Hume Highway and other roads leading from New South Wales. To keep Victoria free of this pest will require continued vigilance on the part of Departmental officers and a continuing appreciation by citizens of their responsibility to see that they do not inadvertently introduce this pest by bringing in fruit through channels where it cannot be carefully inspected by the Department's fruit inspection branch.

The co-operation of all Victorians should also include, of course, the forwarding of specimens of suspected cases (enclosed in tins or jars) to the Department and the destruction, preferably by boiling of all fruits found to be carrying maggots. They should never be thrown away or even placed in normal household rubbish bins.

TRACE ELEMENTS

By J. K. M. SKENE, M.Agr.Sc., Senior Chemist (Soil)

At the present time, attention is being focused on the possibility of increasing the productivity of soils of indifferent fertility through the agency of trace elements. Some spectacular results have been achieved and publicised, consequently many farmers are seeking further information on the subject. This article is intended to answer some of the questions asked. Later articles will deal more specifically with the state of our present knowledge concerning the trace element deficiencies that exist in Victoria, and the investigations being conducted by the Department of Agriculture in relation to these.

Fern ridge country at Bengworden, East Gippsland, suspected of being deficient in copper.

THE ESSENTIAL ELEMENTS

PLANTS and animals make their growth from substances which, in chemical language, are called elements. In nature, the elements usually occur combined in various ways ; for example, calcium, phosphorus and oxygen together form the compound, calcium phosphate.

It is customary to consider the essential elements as belonging to two groups, those required in relatively large amounts, and those necessary in minute quantities. The former group includes the common fertilizer elements, nitrogen, phosphorus, and potassium, as well as carbon, hydrogen, oxygen, sulphur, calcium, and magnesium, all of which are essential to both plants and animals ; in addition, animals need small amounts of sodium and chlorine.

The elements required in minute quantities are variously called " trace elements ", " minor elements", " micro-elements", and " micro-nutrients ". Once used extensively, the term, minor element, is passing out of favour, because it may be misleading by suggesting that these substances play minor parts in plant and animal nutrition. This is not so. The trace elements necessary to plants are iron, copper, zinc, manganese, boron, and molybdenum ; those necessary to animals are iron, copper, zinc, manganese, cobalt, and iodine.

While generally regarded as non-essential for plant growth, traces of iodine and cobalt, normally sufficient for the nutrition of grazing animals, are present in plants, together with more or less of the elements sodium, chlorine, fluorine, silicon, and

aluminium. Traces of many other elements, regarded as non-essential, can be detected also. This is because the soil minerals contain a large variety of elements, and plants have the ability of acquiring traces of these from the soil, whether needed for their growth or not.

TRACE ELEMENT DEFICIENCY

If a plant or animal is unable to obtain enough of a particular element for its normal requirements, a soil deficiency in that element is said to exist for that particular species. This may or may not mean that the soil is deficient in the element for other species, since plants and animals differ in their requirements and, in the case of plants, in their ability to extract the trace elements from the soil. Molybdenum deficiency, for example, occurs in cauliflowers on soils which may supply sufficient molybdenum for normal growth of other vegetables. Again, clovers have a higher demand for molybdenum than grasses, because it is necessary for the nitrogen-fixing processes of their root-nodule bacteria.

Other examples of plants having relatively high trace element needs, or poor extractive powers, are oats and red beet for manganese, swedes and mangels for boron, fruit trees for zinc, and subterranean clover for copper and zinc; while, among animals, sheep and cattle require cobalt, although horses apparently do not.

DIAGNOSIS OF TRACE ELEMENT DEFICIENCIES

Plant and Animal Symptoms

Trace element deficiencies are most readily detected where sufficiently severe to produce visual symptoms, such as abnormalities in the growth of plants, or ill health in animals.

Subterranean clover growth stimulated by molybdenum on plots at Elmhurst.

Insufficiency of a trace element often gives rise to a disease with symptoms which are typical of the deficiency. However, where several deficiencies exist together, the symptoms may be complicated. Descriptive names have been given to many of these diseases. To quote a few examples, "falling" disease and "peat scours" in cattle, enzootic ataxia in lambs, and "wither tip" in cereals, are caused by a deficiency of copper; "coast" disease in grazing animals by a combined deficiency of cobalt and copper; "whiptail" of cauliflowers by a deficiency of molybdenum; "grey speck" of oats by insufficient manganese; "little leaf" of fruit trees by zinc deficiency; and "cracked stem" of celery and "cork" of apples by an inadequacy of boron.

Disordered growth of plants, such as stunting, and various forms of colouration and death of tissues in the leaves, are visual symptoms of nutritional upsets which may be due to trace element deficiencies. In this connexion, the technique of producing experimentally the symptoms due to insufficiency of the trace elements by growing plants under glasshouse conditions in water and sand cultures, has enabled symptoms to be identified in the field. But it should not be overlooked that disorders can arise from other causes, consequently, confirmatory tests are usually necessary to establish whether a trace element deficiency exists.

Plant Analysis

The trace element content of plants grown on trace element deficient soils is usually less than that of plants grown on normal soils. As a consequence of this, analysis of parts taken from affected plants can sometimes reveal a deficient element. But there are difficulties. It is necessary to know what is the normal trace element content in the same parts of healthy plants of the same species. When it is realized that the trace element content varies over wide limits for different species, and between different parts of the same species, and is also influenced by the supply of other nutrients and the stage of growth, it is obvious that much preliminary knowledge of the

chemical composition of plants must be available before analyses of unhealthy plants can be interpreted correctly.

There are also analytical difficulties. Most of the procedures involved are intricate, and the amounts of the elements to be estimated are exceedingly small. For instance, the copper content of leaves may be less than 10 parts per million of their dry weight, their molybdenum content less than 1 p.p.m.

Soil Analysis

Iron and manganese are always present in soils in substantial quantities, but mostly in unavailable forms. On the other hand, the total amounts of copper, zinc, boron, cobalt, and molybdenum normally present are very small.

Little is known of the trace element content of Victorian soils—molybdenum may be less than 1 p.p.m. of soil, and copper, zinc, boron, and cobalt each only several parts per million.

At first sight, an analysis of the soil appears to offer a logical way of finding out whether there is a shortage or otherwise of one or more of the trace elements. But, unfortunately, soil analysis, like plant analysis, has serious limitations. Certainly the total quantity of each of the trace elements in the soil can be found, although such analysis is not a simple one. However, usually these figures are of little use, since much of the quantities found may be inaccessible to plants, and it is difficult to decide on how much is available, which is the important point. There is no way of doing this exactly, although attempts are sometimes made to assess the supplying power of soils for the trace elements by chemical or biological means. Such methods are not in general use for diagnostic purposes, because their usefulness has yet to be established for our soils and crops. In addition, some of the most promising methods are extremely delicate and require special skill and equipment.

There is a further complication, namely, that analytical soil data need to be correlated with established field effects before a satisfactory basis can be arrived at for diagnosis of trace element deficiencies by this means.

Cauliflowers affected with whiptail, due to a deficiency of molybdenum.

Many landholders request the Department to analyse their soils for the trace elements in the hope of detecting deficiencies if they exist. It should be clear from the above that this cannot be done satisfactorily. At the present time, both soil and plant analyses are diagnostic aids principally of value in organized investigations.

Field Trials

Frequently, diagnosis of a soil deficiency can only be made by trying out a number of the suspected elements on field plots. In point of fact, the field trial is the ultimate test for most trace element deficiencies. Such trials are little different from the ordinary fertilizer trials familiar to farmers, except that they are complicated usually by the larger number of treatments to be tested.

Spray Application and Tree Injection

If applied in a soluble form as a spray to the foliage, or as an injection into the limbs of trees, some trace elements can be absorbed directly into the plant, and will ameliorate the visual symptoms of a deficiency if these are not too far advanced. For example, zinc and iron deficiencies of fruit trees, and manganese in vegetables, can be tested for in this way.

Pot Tests

In pot tests, a susceptible plant, such as subterranean clover, is grown in the soil under test in a series of small pots which, as in a field plot trial, receive various combinations of the trace and other nutrient elements. Glasshouse facilities are usually required and considerable care is necessary to avoid contamination of the pot soils with trace elements from outside sources.

Pot tests have the advantage that a large number of factors can be investigated simultaneously, observations on growth can be made conveniently, and the climatic factor is controlled. However, growing conditions are artificial, and pot tests cannot take the place of a field trial, but they frequently supply preliminary information which enables the number of possibilities to be tested subsequently in the field to be reduced.

TRACE ELEMENT TOXICITY

Even if present in amounts not greatly in excess of sufficiency, the trace elements may be poisonous. Sometimes toxic quantities of the essential elements, iron, boron, molybdenum, copper, and manganese occur naturally in the soil and adversely affect the growth of plants or the health of stock.

Boron can be toxic if the water-soluble form in the soil is too high. For example, poisoning has been recorded in citrus in Victoria on soils containing from 2 to 16 p.p.m. of water-soluble boron.

Ingestion of excessive molybdenum causes scouring in stock, and this sometimes occurs in stock grazed on herbage containing a few more parts per million of molybdenum than usual. Such pastures in England are called " teart ".

In very acid soils, harmful effects are sometimes attributed to iron and aluminium, but the most common toxicity in acid soils is due to manganese. Some disorders in fruit trees and in vegetables are suspected of being due to excessive manganese.

Naturally-occurring toxicities due to copper and zinc have not been found in plants, but excessive uptake of copper is considered responsible for ill health in sheep grazed on herbage of high copper content.

The occurrence of trace element excesses in nature, and the readiness with which poisoning can be induced artificially, are warnings against the indiscriminate application of trace elements, either to the soil or to the foliage of plants. Unlike the common fertilizers, a single application to the soil probably lasts for years, except in special cases.

AVAILABILITY IN THE SOIL

Usually only a fraction of each trace element in the soil is accessible to plants. The proportion that is available depends on several soil factors. Of these, the reaction, that is, the degree of acidity or alkalinity, and the organic matter content, are the most important, particularly since these factors can be altered by agricultural practices.

The naturally-occurring iron, copper, zinc, boron, cobalt, and manganese compounds in the soil can be utilized by plants more easily under acid than under alkaline conditions. In fact, on some alkaline soils, plants are unable to extract sufficient copper, zinc, and manganese for their requirements, although apparently adequate amounts may be present. On the other hand, some soils, including both acid and alkaline types, have insufficient total supplies of copper, zinc, boron, and cobalt; copper deficiency in subterranean clover on certain acid sandy soils is due to this cause.

Molybdenum acts in the reverse way, being least available to plants in acid soils. Alkaline soil conditions favour its availability.

The implications attached to the common agricultural practice of liming to reduce soil acidity can now be understood in relation to effects on the availability of the trace elements. Manganese provides a good example of an element sensitive to soil reaction. Adequate supplies are present in nearly all soils. Deficiencies are rarely, if ever, encountered in highly acid soils because of high availability of the manganese, but cases of induced manganese deficiency have been reported where some acid soils have been limed excessively. Vegetables and oats are the crops most commonly affected. Copper deficiency also

can sometimes be aggravated by liming, but to a lesser degree; for example, in subterranean clover grown on poor, acid, sandy soils. On the other hand, it is suspected that the response of clover to lime on certain acid soils is due to the action of the lime in increasing the amount of naturally-occurring molybdenum available to the plant.

Organic matter acts in reducing the availability of copper. Thus, shortage of copper occurs sometimes on peaty soils, and on marsh soils high in organic matter. A larger than normal corrective application may be required on such soils to overcome the absorptive capacity of the organic matter for copper.

Organic matter is also associated with the availability of manganese. Alkaline peaty soils, and soils high in organic matter made alkaline by liming, are subject to manganese deficiency. However, the availability of manganese is also affected by the aeration of the soil, and temporary waterlogging of organic soils can, by reducing the air supply in the soil, greatly increase the available manganese.

CORRECTING DEFICIENCIES

Several ways of correcting trace element deficiencies are available. The commonest method is to apply a dressing of the deficient element to the soil, usually in the form of one of its water-soluble compounds mixed with superphosphate. Soil treatment induces an increased uptake of the trace element by the plant. Deficiencies of copper and cobalt in stock can be alleviated indirectly in this way. Alternative methods for stock are to drench, or to give the stock access to licks containing the deficient element, the former usually being preferred.

The normal soil dressing is only a few pounds, sometimes only ounces, of the trace element per acre. The compounds used for each particular deficiency, and the amounts commonly applied per acre in tests are: copper sulphate, 7 lb.; zinc sulphate (hydrated) 7 lb.; borax, 4 lb.; manganese sulphate, 28 lb.; iron sulphate, 56 lb.; cobalt sulphate, 4 oz.; sodium or ammonium molybdate, 2 oz. Larger quantities are used in certain circumstances, e.g., in some cases of deficiencies in vegetables and horticultural crops.

The trace elements are most easily and evenly applied to the soil by incorporating them with the normal fertilizer dressing, or with a spreader such as sand or loose soil. The trace element compounds require to be finely subdivided but, even so, the small amounts involved make thorough mixing difficult, consequently, ready-mixed fertilizers are to be preferred. At the present time, the following superphosphate mixtures are marketed, each trace element being at the rate shown per 187-lb. bag—superphosphate + 7 lb. zinc sulphate (anhydrous); superphosphate + 14 lb. zinc sulphate (hydrated); superphosphate + 7 lb. copper sulphate (hydrated); superphosphate + 7 lb. copper sulphate (hydrated) + 7 lb. zinc sulphate (hydrated); superphosphate + 7 lb. copper sulphate (hydrated) + 6 oz. cobalt sulphate or chloride; superphosphate + 2 oz. molybdenum oxide and/or sodium molybdate. The amount of zinc in 14 lb. of hydrated zinc sulphate is approximately the same as that in 7 lb. of anhydrous zinc sulphate. Fertilizer companies do not market the trace element materials separately—these are obtainable from chemical supply firms—but will make up mixtures to order, if required.

Citrus tree affected with boron poisoning.

"Little leaf" of apple due to zinc deficiency. Healthy leaves, left, affected shoots, right.

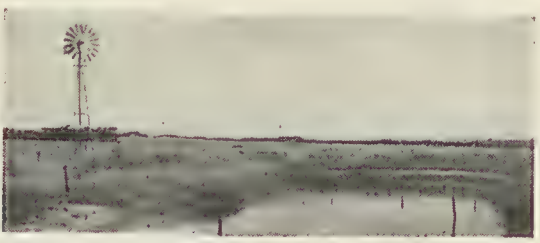
The correction of deficiencies by spraying is sometimes practised with intensively-grown crops. Spraying is rapid in its effects, but may need to be repeated with subsequent crops, or at intervals in the case of fruit trees. Soil application, while slower in action, is more lasting.

While there are soils of good general fertility which exhibit trace element deficiencies—zinc deficiency in the Wimmera black soils is perhaps the best example—it is emphasized that these deficiencies are more commonly associated with soils of low fertility. On such soils, it is important to meet all plant-food deficiencies if their productivity is to be substantially increased. Depending on their utilization, this will mean supplying adequate amounts of one or more of the elements, phosphorus, potassium, and nitrogen, and sometimes lime also, in addition to the lacking trace elements.

Sometimes the increased growth brought about by the use of trace elements induces secondary deficiencies after a time. For example, infertile sandy soils brought initially into greater production through the use of superphosphate and copper on subterranean clover pastures, sooner or later may be in danger of developing potassium deficiency in the herbage under some systems of management.

The economic aspect needs to be considered in any attempt to improve agricultural production, and this applies particularly to the development of poorly-productive pastoral lands. Trace elements have been shown to be essential to the development of many such soils, but it should be clear from the foregoing that they alone are not sufficient. Substantial dressings of superphosphate are usually required, while costs will be increased considerably if lime or potash is likely to be needed too. Also, pasture improvement is dependent on the establishment of a suitable legume, and frequently this takes place slowly. In any such developmental programme, the trace elements are the least expensive item.

While our present knowledge regarding trace element deficient soils in Victoria is far from complete, the available evidence indicates that the majority of our soils contain adequate supplies, and that where normal responses to fertilizing are obtained, the use of trace elements in addition is unlikely to be of further benefit.



LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

DO NOT FEED ARTIFICIAL FERTILIZERS TO STOCK

CERTAIN fertilizers improve crop and pasture yields and sometimes it has been argued that, because these fertilizers are so necessary for satisfactory plant growth, they should be fed to the farm animals feeding upon the herbage growing there.

A case of zinc poisoning was reported recently from the western Wimmera, where there is a zinc as well as the common phosphate deficiency in the soil. Superphosphate containing 7 to 14 lb. of zinc sulphate per bag of 187 lb. is widely used there to fertilize wheat crops, and, in the case referred to, the farmer was feeding this fertilizer mixed with salt as a lick to his stock. Some fatalities had occurred amongst his sheep and others were obviously ill. In such a lick sodium, chlorine, zinc, sulphur, calcium, phosphorus, and fluorine, all essential elements for the well-being of animals, are present, but not in the form and quantity in which they were being supplied in this lick. Zinc in this case was apparently being taken in toxic doses.

Copper sulphate or bluestone mixed with superphosphate is used as a fertilizer in many copper-deficient areas along the southern coastline and, if this fertilizer is fed to stock, copper poisoning could easily occur.

Zinc and copper sulphates are very soluble salts and under favorable conditions could be readily absorbed in toxic quantities by animals eating them. Where these minerals are deficient in the soil, the quantities absorbed by plants fertilized with them are usually adequate for the well-being of the animals.

It is also unwise and unnecessary to feed superphosphate direct to stock, because of its acid nature and the possibility of the stock receiving too much fluorine. Some fluorine is essential in the diet for the hardening of the enamel on the teeth, but slight overdoses lead to degeneration of the skeleton, usually first noticed by the decay of the bony material under the enamel of the teeth. In superphosphate the soluble phosphate and the gypsum (calcium sulphate) may also be harmful.

No fertilizer should be fed to farm animals either in a lick, in the food or in the drinking water.

[A.C.T.H.]

LIVE STOCK PRODUCTION IN VICTORIA

Meat Production

The Commonwealth Bureau of Census and Statistics has released figures which show that meat production in 1952 increased by 22,760 tons in Victoria compared with the previous year. The increase was brought about by the large numbers of sheep and lambs slaughtered. These accounted for over 20,000 tons more mutton and nearly 15,000 tons more lamb. Beef and veal production declined by 10,508 tons and pig meats by 1,866 tons.

The very high production of mutton and lamb exceeded expectations and the two main factors responsible were (i) sheep numbers had risen to an all-time record level in Victoria last year, and (ii) with some anxiety concerning the wool market in the latter part of 1951 more ewes were mated for fat lamb production in the early part of 1952.

The availability of mutton and lamb at relatively cheap prices in conformity with export parity, reduced the demand for beef. The average increase of 9d. per pound in the retail price of beef approved by the Prices Commissioner in October, 1952, reduced the demand for beef and had a very depressing effect on beef cattle prices, which fell about £20 per head. As a result fewer cattle have been slaughtered. Throughout the calving season the demand for bobby calves was irregular and some 77,000 fewer were slaughtered. If more calves had been reared the beef and dairy farmers would have their properties fully stocked, but it is feared that most of those calves not slaughtered have been destroyed on farms.

Meat production should remain at a high level again in 1953, with possible increases in mutton and lamb production. Increased beef production will depend upon the demand by consumers. At the present high prices, demand is likely to be restricted, reducing competition for cattle on the hoof and discouraging the import of fat and store cattle from adjoining States.

Following the recent outbreaks of pleuro-pneumonia amongst cattle from New South Wales, graziers will need the assurance of stable prices on the hoof before they are likely to risk bringing cattle from New South Wales. Pig production is likely to remain at the present low level of production due to increased prices of pig foods and the continued switch over to the supply of whole milk by dairy farmers from the supply of cream when pigs were kept to consume the skim milk.

The trends in meat production in the other States have followed those in Victoria.

STOCK SLAUGHTERED (THOUSANDS OF HEAD).

	Victoria.		Australia.	
	1952.	1951.	1952.	1951.
Cattle ..	599	613	2,669	2,651
Calves ..	284	361	1,030	1,187
Sheep ..	3,935	2,902	10,628	8,316
Lambs ..	3,666	2,723	8,848	6,447
Pigs ..	312	343	1,455	1,565

MEAT PRODUCTION (TONS).

	Victoria.		Australia.	
	1952.	1951.	1952.	1951.
Beef and veal	128,571	139,079	604,731	637,696
Mutton ..	78,149	57,954	206,799	160,064
Lamb ..	57,346	42,508	138,727	99,219
Pig meats..	18,156	19,922	80,421	85,995
Total ..	282,222	259,462	1,030,678	982,974

Dairy Production

Dairy production has been at a high level from July 1 to December 31, 1952. In Victoria, there has been a slight drop compared with the same period of 1951, but very substantial increases have occurred in New South Wales and Queensland following the drought during the previous year. Small increases have also been recorded in the other three States.

DAIRY PRODUCTION.

(Thousands of Gallons of Milk).

For Six Months Ending 31st December,	Victoria.	Australia.
1952	280,867	691,589
1951	288,689	594,248
1950	275,186	687,823

RECORD MARKS FOR PIG CARCASS

A Victorian record score of 91 marks out of a possible 100 for breeders' points in the Smithfield method of judging bacon pig carcasses was gained by the entry of Mr. W. E. Ware, Jumbunna, in the Korumburra Show pig competition in February.

The pig was from a Wessex Saddleback sow and was sired by a Berkshire boar. It was 6½ months old and its carcass weighed 169 lb. dressed. The carcass gained marks as follows:—

Plumpness of hams, 7½ (possible 8); fineness of shoulders, 5 (7); length of middle, 18 (20); shortness of legs, 4 (5); abundance of lean, 28 (28); right amount of fat, 18 (20); thickness and leanness of streak, 10½ (12). Total marks 91 (100).

It was a very good pig in all respects. Some people who saw the live pig considered it was too fat. That was not so. Its body was relatively thick because of the thick muscles of its back, but actually it was slightly deficient in back fat.

The winner gained a clear victory in the strong class of 20 carcasses, which scored an average of 74.3 marks out of the possible 100.

Mr. Ware won the same competition last year with a pig by the same sire and from the same sow. Its carcass weighed 163 lb. and it scored 86 marks when the average score of the 15 entries in the class was 70.7 marks.

Several breeds and crosses were represented in this year's Korumburra show competition. Second prize was won by Mr. Lindsay Richards, Dumbalk, with a 5½ month old Large White pig, whose carcass weighed 151 lb. and scored 83 marks. Mr. E. J. Grabham's (Kongwak) pig weighing 163 lb. dressed was third with 82½ marks.

In this competition, each entry consisted of a pair of pigs. One of each pair was exhibited at the Korumburra Show, while the other was slaughtered at Lloyd's bacon factory, Frankston. Each carcass was appraised and a section of the loin of each was exhibited together with its score card in an iced show-case in the show pavilion.

Section of loin of the first-prize baconer entered by Mr. W. E. Ware, in the Korumburra Show pig competition.

The experience gained by competitors in pig carcass competitions such as this is resulting in the production of better pig carcasses, both for competitions, and for ordinary trade. Such competitions allow pig raisers to see the meat of their pigs as consumers see it on the plate. Thus they can correct any obvious errors in their pig breeding and feeding so as to produce pigs with abundant lean meat and the correct amount of fat, as most people like their pork and bacon.

[L. A. Downey, H.D.A., Pig Expert.]

PORTLAND PIG CARCASS COMPETITION

A pig carcass competition was conducted in the Portland district for the first time last February.

The competition was sponsored by the Portland Pastoral, Agricultural, and Horticultural Society. The pigs were treated by Messrs. Thos. Borthwick and Sons at their Portland meat works. The carcasses were judged at the works on the Smithfield method by Mr. G. C. Griffith, Pig Husbandry Adviser, Department of Agriculture. Later, the loin cuts of carcasses were exhibited at the Portland show. Each exhibitor was permitted two entries and 28 carcasses were presented for judging. They were in two classes, porkers from 60 lb. to 120 lb. and baconers from 130 lb. to 170 lb.

In the pork class, seven competitors entered eleven carcasses whose average dressed weight was 96 lb. Their average score was 60 marks out of the possible 100. The first prize winner was Mr. N. Hardy of Studley Park, Macarthur with a pig of ¾ Large White and ¼ Wessex Saddleback breeding.

It had a carcass weight of 115 lb. It scored 81½ marks, including the possible 28 for thickness of muscle and 19 out of the possible 20 for thickness of fat.

In the bacon pig class, eleven competitors exhibited 17 entries but 5 of them were disqualified because they were outside the specified range of weight. The twelve baconer carcasses judged had an average weight of 146 lb. and gained an average of 72 marks from the possible 100.

The 1st prize baconer carcass was from a Large White with a carcass weight of 137 lb. It scored 82 marks. The winner was exhibited by Mr. S. Beauglehole of Gorae West.

The marks gained by the winning baconer were as follows :—Hams, 7½ (possible marks 8); shoulders, 6 (7); streak, 7½ (12); thickness of muscle, 27 (28); thickness of back fat, 18 (20); length of body, 12 (20); shortness of legs, 4 (5).

[L. A. Downey, H.D.A.].

BEEKEEPING

Preparation for the Winter

With the approach of winter, it becomes necessary to look to the winter needs of the bees. All colonies should be checked for strength and stores, and to ensure that the hives are weatherproof. It is most important to see that each colony has adequate supplies of sealed honey, for winter and spring food, bearing in mind that the stronger the colony the more food it will require. Also, when checking stores, locality and climate should be taken into consideration, as when outside temperatures are low bees consume more honey for maintaining the necessary living temperature of the cluster.

Approximately 40 lb. of honey should be left for each colony of medium strength. Bees are best wintered in a mild climate and sheltered from southerly winds, and in a locality where there is no blossom to encourage them to work. It is better for them to conserve their strength by remaining dormant throughout the winter months.

Hives should be made as compact as possible, leaving no empty comb space to allow the storing of fresh honey before the spring should there be blossom within the reach of the bees, and no open space in the hive to allow the escape of warmth from the cluster.

Weak or queenless hives should be united with normal hives. All hives should be tilted slightly forward to allow drainage of condensation and excess moisture.

[C. D. Ilton, Apiary Inspector.]

POULTRY BREEDING

Most hatcherymen use a small number of pullets for breeding, but these young birds have been used on a wholesale scale in recent years. The enormous demand for chickens encouraged hatcherymen to employ every available bird for breeding, but the demand has now dropped to pre-war levels.

There is a speculative element in pullet breeding, and it is only recommended for controlled methods where the pullets have been progeny tested and their fecundity, growth, production, and viability are known to be good.

Commercial poultry farmers depend on hand selection for the choice of their breeding stock and, as this is based on personal judgment rather than factual evidence, it is unwise to increase the risk by including pullets in the breeding flock.

A pullet is an unknown factor unless it belongs to a proven family of birds. It may die before the end of its first year of production, and if it had been bred from beforehand, its physical weaknesses may have been transmitted to its progeny. Some authorities maintain that pullet breeding is responsible for the spread of the disease Leucosis in poultry flocks.

There are some large commercial poultry farmers who use only second and third year birds for breeding, and a check of these farms shows an almost complete absence of leucosis, and an extremely low rate of mortality among the chickens during rearing.

Pullets are used mainly for the hatching of June and July chickens, as the adult stock are just recovering from the moult. When adult birds are used, they are usually forced into the moult during the latter part of March. Some breeders prefer to allow the birds to recover normally, while others hasten the moult by putting the birds under artificial lights. It is not a desirable practice to force birds to moult, but it is better to do this than resort to breeding from pullets.

Viability, and resistance to disease are important factors in poultry breeding, but they have assumed greater importance in recent years, because the incidence of disease appears to be increasing.

[M. D. Hall, Poultry Expert.]

SKIN MITE DISEASE ON SHEEP

(PSORERGATES OVIS)

By E. H. MILES, B.V.Sc., Veterinary Stock Inspector

IN recent years outbreaks of a skin disease in sheep resembling lice infestation have become more prevalent in Victoria. Most cases have occurred in merino flocks in the Western District and Wimmera. The condition is caused by a microscopical mite, *Psorergates ovis* (pronounced sorr-erg-at-ees), which invades the superficial layers of the skin and sets up a severe and constant irritation.

Affected sheep scratch or bite themselves, or rub against fences, posts and logs, which leads to a torn and ragged appearance of the fleece. The disease most commonly appears on the side, flank, or thigh as a whitish patch, the wool showing a stringy staple and a dry, pointed tip. In advanced cases, the fleeces become badly matted and difficult to shear. Apart from an accumulation of scurf on the surface, the skin itself may not appear to be greatly altered. Infestation will lead to a severe drop in the value of wool, instances being recorded where affected fleeces have been both reduced in weight and have brought only two-thirds the price of top-line samples.

The disease spreads slowly, up to three or four years being necessary for a sheep to become seriously infested. Spread from sheep to sheep appears to occur most quickly following shearing, and the shorn ewe will often transmit the mite to its unshorn lamb. This explains the contention of some sheep-owners that the incidence of the disease increases after shearing.

Send Specimens for Examination

As the mites cannot be detected by the naked eye, specimens should be sent to the Veterinary Research Institute, Story-street, Parkville, Victoria, for laboratory examination. To obtain the necessary skin scraping, a small area on the body should be clipped very closely with a pair of curved scissors. The skin surface is then smeared with liquid paraffin and scraped with a sharp scalpel or small knife. The superficial layers of skin should be removed. The scraping, therefore, will need to be done quite vigorously. The sample, together with a little liquid paraffin is then placed in a bottle and forwarded to the laboratory. It is advisable to take skin scrapings from different parts of the one sheep and from several other typical cases. Full particulars of the suspected outbreak should accompany the specimens.

Fig. 1.—Above: Normal staple from uninfested skin. Below: Abnormal staple from infested skin on the same animal, but 8 inches away from normal staple.

[After *Aust. Vet. Jnl.*

Dipping

Dips containing arsenical, carbolic, rotenone and gammexane preparations are quite unsatisfactory in the control of *Psorergates*. Lime-sulphur dips, on the other hand are, in some cases, very efficient. A single dipping

Fig. 2.—A typical case, Merino ewe infested with Psorergates ovis, showing formation of ragged tassels.

[After *Aust. Vet. Jnl.*

may be sufficient to eradicate the pest, provided the operation is carried out in a thorough manner.

While the dipping fluid can be made on the farm, the use of commercially prepared lime-sulphur of guaranteed composition is recommended as the percentage of active agent, polysulphide, in home-made preparations varies.

Lime-sulphur concentrate is supplied by various firms as orchard spray, and contains 20 per cent. polysulphide. A solution containing 1 per cent. polysulphide is efficient in eradicating the mite. The concentrate solution, therefore, should be diluted with clean water 1 in 20. To obtain efficient penetration of the wool, a wetting agent—Agral 3, at the rate of 6 oz. to each 100 gallons, should be added to the diluted lime-sulphur preparation.

As lime-sulphur irritates wounds, sheep should not be dipped "off-shears." Preferably, a fortnight should be allowed to elapse between shearing and dipping, when the wounds will have healed and the wool will still be short, ensuring good penetration.

The sheep should be immersed for at least 30 seconds, care being taken to see that they are thoroughly wetted, particularly on top of the head, and that they do not inhale or swallow the dip. Rapid death invariably follows if the fluid is breathed into the lungs and it is very poisonous if swallowed.

A single dipping may not always eradicate the mite and, in such cases, re-dipping should be carried out.

CERTIFIED PULLORUM-TESTED POULTRY FLOCKS

A certified Pullorum-tested Flock is one in which all stock over six months of age have given a negative reaction to the agglutination test for Pullorum Disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector, but it is not necessarily a guarantee of the type of birds in the flock.

The under-mentioned flocks have been certified by the Department of Agriculture, and will remain so for the current calendar year, or until such time as the Chief Veterinary Inspector determines.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Particulars of breeds of birds tested are as shown hereunder:—

A. Australorp; B. White Leghorn; C. Rhode Island Red; D. Sussex; E. Langshan; F. Brown Leghorn; G. Buff Orpington; H. Black Leghorn; I. Minorca; K. Legbar; L. Turkeys; M. New Hampshire; N. Plymouth Rock; O. Indian Game; P. Ancona.

Owner.	Breed.	Number of Birds.	Owner.	Breed.	Number of Birds.
McQueen, R. J., Spring-road, Highett	C	517	Shulze, L. H., Torquay-road, Grovedale	A, B	1,749
Myer Emporium ("Norman Lodge," Mt. Eliza)	A, B	2,320	Waiting, T., Scoresby-road, Boronia	A, B	1,735
Ridge and Son, Myrtle-grove, Blackburn	B, C, D	3,527			

Burnley Egg-Laying Competition

Final Results, 1952-53

By MARTIN D. HALL, Poultry Expert

The White Leghorn (left), owned by Mr. W. J. Cooke, was highest producer in this year's Burnley Egg-Laying Competition, with a total of 305 first-grade eggs. The White Leghorn at right, owned by Mr. J. T. Fraser, topped the wet mash class with a score of 285 eggs, all first-grade.

THE forty-second egg-laying competition for fowls, conducted at the School of Primary Agriculture and Horticulture, Burnley, commenced on April 1, 1952, and concluded on March 2, 1953, a period of 48 weeks.

The single test competitions continue to be well supported by breeders, as the whole of the accommodation provided for this competition was filled. The accommodation consisted of 232 pens, each housing one bird. Applications for the 1953–54 competition, which has just commenced, were in excess of the number of pens available and a ballot had to be conducted.

The beneficial effect of the competition on the industry as a whole is widely recognized, and the introduction to commercial poultry farms of the progeny of birds which have distinguished themselves at Burnley has greatly improved the quality of Victorian poultry flocks generally.

The historic pattern of Burnley enlarges with each competitive year, as young, enthusiastic breeders supersede those who have distinguished themselves in the past. Some of the latter have gone quietly into retirement, while others have passed away, but the industry has benefited by their efforts, and their names are preserved in the past records of the competition.

In the 48-weeks period of the competition just concluded, the best performance was that of a White Leghorn entered in the dry-mash class by Mr. W. J. Cooke. This bird laid 305 first-grade eggs, the highest score in all classes of the competition. Mr. Cooke was also awarded the Burnley champion sash.

Very creditable scores were also recorded by the winning birds in the classes for White Leghorns, wet mash, and Australorps. Mr. J. T. Fraser's White Leghorn laid 285 first-grade eggs, and an Australorp owned by Mr. H. D. Cumming laid 284 first-grade eggs. These competitors were also awarded second and third prize Burnley sashes respectively.

A good performance was recorded by a Chinese Langshan owned by Mr. J. Lang. This bird laid 273 first-grade eggs. Mr. Lang was successful in winning this class in last year's competition with a bird of the same breed.

The Langshan (left), entered by Mr. J. Lang, laid 2/3 first-grade eggs. Right, Mr. H. D. Cumming's Australorp, Class 4, produced 284 Grade 1 eggs.

A Rhode Island Red entered by J. and O. R. Fellows, laid 268 eggs, all first-grade, and a Legbar owned by "Glenyuille," Stud Poultry Farm (Mr. H. D. Stewart) laid 232 first-grade eggs.

Rhode Island Reds are becoming increasingly popular among breeders. Twenty-three entries, comprising 46 birds, were entered in the competition. The mortality among the competing birds was low—4·3 per cent.

In the competition, prize certificates and sashes were awarded the owners of the birds laying the greatest number of first-grade eggs. During the first two months of the competition, a first-grade egg must weigh not less than $1\frac{3}{4}$ oz., and thereafter not less than 2 oz. At Burnley, every egg is weighed to one-tenth of an ounce. The records are available for examination by any competitor.

AVERAGE EGG PRODUCTION

There were 232 fowls in the competition at its commencement, but 10 died. The total number of days these latter birds

STATEMENT SHOWING THE NUMBER OF EGGS LAID BY THE VARIOUS BREEDS IN THE COMPETITION, AND THE AVERAGE NUMBER OF EGGS LAID PER BIRD

Breeds.	Number of Birds after Allowing for Deaths.	Eggs Laid.			Average Number of Eggs Laid per Bird.		
		First Grade.	Under-weights.	Total.	First Grade.	Under-weights.	Total.
Light Breeds—Wet Mash—White Leghorns ..	75	14,524	1,326	15,850	193·7	17·7	211·3
Other Light Breeds—Wet Mash	19	3,014	347	3,361	158·6	18·3	176·9
Light Breeds—Dry Mash	24	4,674	247	4,921	194·8	10·3	205·0
Total Light Breeds—Wet and Dry Mash ..	118	22,212	1,920	24,132	188·2	16·3	204·5
Heavy Breeds—Wet Mash.							
Australorps	58	10,840	937	11,777	186·9	16·2	203·1
Rhode Island Reds	44	8,285	551	8,836	188·3	12·5	200·8
Other Breeds	8	1,539	88	1,627	192·4	11·0	203·4
Total—Heavy Breeds	110	20,664	1,576	22,240	187·9	14·3	202·2
Total—All Breeds	228	42,876	3,496	46,372	188·1	15·3	203·4

collectively were in the pens was 2,007, which is equal to approximately six birds having been there for the full 48 weeks. Therefore, the total number of birds in the competition for the whole period may be regarded as 228, and this is the figure used in working out the averages.

The total number of eggs laid, including those underweight, was 46,372, an average per bird of 203.4 for 48 weeks.

The price realized for the eggs averaged 4s. 5½d. per dozen, while the market value of the eggs averaged £3 12s. 9d. per bird. The price received for the eggs however, are the net prices, exclusive of freight, commission, and other charges. Also, it must be remembered that the eggs were laid by pullets in their first period of production under conditions entirely different from those on commercial farms, where birds of various ages are kept in large flocks.

This Rhode Island Red, owned by Messrs. J. and O. R. Fellows, laid a total score of 268 first-grade eggs.

FIRST-CLASS CERTIFICATE OF MERIT TO OWNERS OF HENS IN CLASSES 1, 2 and 4, WHICH LAID 240 FIRST-GRADE EGGS, AND IN CLASSES 3 and 5, WHICH LAID 220 FIRST-GRADE EGGS.

Pen No.	Name and Address of Competitor.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash.	
186	"Norman Lodge" Poultry Farm (W. O. Pederick), "Norman Lodge," Mt. Eliza	266
191	J. Rasmussen, Warrigal-road, Cheltenham, S.22	265
172	"Kingsley Park" Poultry Farm (G. J. Teitz), 21 Kingsley-crescent, Mont Albert	263
135	"Anleigh" Poultry Farm (W. E. Reed), Springs-road, South Clayton	260
189	A. G. Price, 6 Cooper-street, Essendon, W.5	259
181	K. C. McKenzie, 82 Clarence-street, Geelong West	257
208	H. Wright, 14 Kenilworth-street, Reservoir, N.19	255
146	J. Bray, 18 Hotham-street, Warrnambool	252
160	W. J. Goddard, 356 High-street, Bendigo	252
184	P. C. Moir, 1 Esplanade, Western Beach, Geelong	250
187	W. J. Ogden, 16 Cathcart-street, Maidstone	246
164	L. J. Jackson, 241 Tooronga-road, Glen Iris, S.E.6	245
193	E. G. Sargeant, 261 O'Hea's-street, Pascoe Vale	245
169	D. Keating, Keys-road, Moorabbin ..	243
143	W. J. Bradshaw and Son, Valley-road, Highton, via Geelong	243
200	A. J. Waugh, Helms-road, Kangaroo Flat	243
156	E. E. Gallus, Centre-road, Vermont ..	241
141	"Boomerang Stud" (H. G. Harvey), McArthur-avenue, St. Albans	240
201	Mrs. F. Waugh, Cemetery-road, Kangaroo Flat	240
	Class 2.—White Leghorns—Dry Mash.	
222	A. Johnson, Sunray-avenue, Cheltenham, S.22	257
	Class 2.—White Leghorns—Dry Mash—*continued.*	
214	W. J. Cooke, 105 Waxman-parade, West Brunswick	252
230	J. T. Simmonds, 6 Lindsay-avenue, Murrumbeena, S.E.9	249
217	J. W. Harris, 93 Sheffield-street, Preston, N.18	246
	Class 4.—Australorp—Wet Mash.	
13	A. R. Davey and Son, Sellars-street, Greensborough	259
20	"Greenhills Stud" Poultry Farm (I. H. Frye), Grimshaw-street, Watsonia	257
7	A. H. Brown, 43 Collins-street, Thornbury, N.17	257
6	"Braunstone" Poultry Farm (G. H. Roadley), Springvale-road, Springvale South	243
	Class 5.—Rhode Island Reds—Wet Mash.	
73	"Dallis" Stud Poultry Farm (Thompson and Murrell), 36 Middle-road, Maribyrnong, W.3	242
105	J. C. Wallace, Lancefield	237
69	"Chessington" Stud Poultry Farm (P. H. Eggleton), cr. Starcross-avenue and Lemnos-street, Croydon	235
91	D. McKay, 14 Landells-road, Pascoe Vale, W.8	233
74	"Dallis" Stud Poultry Farm (Thompson and Murrell), 36 Middle-road, Maribyrnong, W.3	231
87	E. J. Ikin, 44 Mackay-street, Seddon, W.13	231
90	F. Kennedy, Ferntree Gully-road, Glen Waverley	226
92	D. McKay, 14 Landells-road, Pascoe Vale, W.8	226
78	J. Gillies, 35 River-street, Maribyrnong	221

Prize List, Burnley Egg-Laying Competition, 1952-53

SINGLE TEST

Pen No.	Name and Address of Competitor.	Total.	Under-weight.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash.			
	First Prize—Champion Certificate, also Second Prize—Burnley Sash.			
154	J. T. Fraser, 19 Collins-street, Bentleigh, S.E.14	285	..	285
	Second Prize—Government Certificate.			
157	"Gibbs Highway Stud" (J. L. Gibbs), Main Eltham-road, Lower Plenty	289	9	280
	Third Prize, Government Certificate.			
185	"Norman Lodge" Poultry Farm (W. O. Pederick), Norman Lodge, Mt. Eliza	267	..	267
	Class 2.—White Leghorns—Dry Mash.			
	First Prize—Champion Certificate, also Burnley Champion Sash.			
213	W. J. Cooke, 105 Waxman-parade, West Brunswick	305	..	305
	Second Prize—Government Certificate.			
219	J. B. Horsfall, High-street, Doncaster	268	1	267
	Third Prize—Government Certificate.			
218	J. W. Harris, 93 Sheffield-street, Preston, N.18	265	5	260

Brown Leghorn entered by Glenyuille Stud, (Mr. H. D. Stewart), won Class 3 of the Competition with a total of 232 first-grade eggs.

Pen No.	Name and Address of Competitor.	Total.	Under-weight.	First Grade Eggs.
	Class 3.—Light Breeds, other than White Leghorns—Wet Mash.			
	First Prize—Champion Certificate.			
121	"Glenyuille" Stud Poultry Farm (H. D. Stewart), Marshall-street, Maryborough (Legbar)	232	..	232

As only one bird laid more than the required number of eggs (220) in this Class, no Second or Third Prizes were awarded.

	Class 4.—Australorps—Wet Mash.			
	First Prize—Champion Certificate, also Third Prize—Burnley Sash.			
12	H. D. Cumming, Jellalabad, Darlington	286	2	284
	Second Prize—Government Certificate.			
43	W. A. Russell, 62 Lower Dandenong-road, Mentone, S.12	273	..	273
	Third Prize—Government Certificate.			
2	A. J. C. Anderson, 266 Barker-street, Castlemaine	272	8	264
	Class 5.—All Heavy Breeds, other than Australorps and Rhode Island Reds—Wet Mash.			
	First Prize—Champion Certificate.			
61	J. Lang, 46 Dundas-street, Thornbury, N.17 (Langshan)	274	1	273
	Second Prize—Government Certificate.			
66	G. E. Wilson, Box 16, Yarra-road, Croydon (Chinese Langshan)	253	..	253
	Third Prize—Government Certificate.			
65	G. E. Wilson, Box 16, Yarra-road, Croydon (Chinese Langshan)	224	..	224
	Class 5.—Rhode Island Reds—Wet Mash.			
	First Prize—Champion Certificate.			
75	J. and O. R. Fellows, "The Rest," Yan Yean-road, Plenty	268	..	268
	Second Prize—Government Certificate.			
77	J. Gillies, 35 River-street, Maribyrnong	269	7	262
	Third Prize—Government Certificate.			
67	J. R. Armstrong, 657 Bell-street, West Preston	256	6	250

TABLE OF MONTHLY LAYING RETURNS, BURNLEY EGG-LAYING COMPETITION — 1952-53

Month.	Light Breeds.						Heavy Breeds.					
	White Leghorns.			Other Light Breeds.			Australorps.			Other Heavy Breeds.		
	Average No. of Birds.	Total.	Average.	Average No. of Birds.	Total.	Average.	Average No. of Birds.	Total.	Average.	Average No. of Birds.	Total.	Average.
April	100	1,451	14·5	20	245	12·3	58	940	16·4	54	823	15·2
May	100	1,607	16·1	29	280	14·0	58	989	17·1	54	870	16·1
June	100	1,648	16·5	20	261	13·1	58	1,109	19·1	53	845	15·9
July	100	1,747	17·5	20	197	9·9	58	1,157	19·9	52	925	17·8
August	100	2,195	21·9	20	355	17·8	58	1,206	20·8	52	1,078	20·7
September	98	2,263	23·1	19	393	20·7	58	1,276	22·0	52	1,144	22·0
October	98	2,171	22·2	19	413	21·7	58	1,263	21·8	52	1,225	23·6
November	96	2,114	22·0	19	365	19·2	58	1,101	18·9	52	998	19·2
December	96	2,110	21·9	19	311	16·4	58	1,029	17·7	52	949	18·3
January	95	1,897	19·9	18	304	16·9	58	895	15·4	52	842	16·2
February and March, 1st and 2nd ..	95	1,568	16·5	18	237	13·2	57	812	14·2	52	764	14·7

Book Review

MATERIALS HANDLING IN THE WOOL INDUSTRY

(Report prepared by Materials Handling Branch, Division of Industrial Development, Department of National Development, 119 Phillip-street, Sydney (Halstead Press Pty. Ltd. 25s.).

Materials Handling In The Wool Industry is strongly recommended to all concerned in the handling of wool. The Materials Handling Branch, Department of National Development, has greatly assisted in the reduction of handling costs in many secondary industries in Australia during recent years. Since 1947 the branch has been investigating handling in the wool industry. This report is the result of a preliminary reconnaissance survey of wool handling practices on the farm in the major wool growing districts in all States, and also in transporting, storing and selling.

Today, wool handling costs are approximately £10 per bale. The indications are that these costs could be substantially and profitably reduced without any considerable capital expenditure. The report gives a valuable lead on practices which could be modified or investigated, with a view to increasing efficiency and reducing costs.

For the producer, it sets out useful information on factors important in the design and layout of sheds, yards and equipment, which are well illustrated with plans and drawings. In addition, there are valuable recommendations for increasing the efficiency of shed operations.

A strong case is presented for standardization in the industry, particularly in relation to classing, coding, bale marking and trade terms. Valuable recommendations are made for increasing the efficiency of wool transport and selling which are major items of cost.

[P. Hyland, B.Agr.Sc.]

THE MALLEE CHAMPIONSHIP

Report of the Judge, J. McC. McCANN, B.Agr.Sc., Agronomist

The tenth annual competition for the Champion Wheat Crop of the Mallee, held in 1952, was won by Mr. J. W. Ballantyne of Sea Lake, whose crop of Insignia returned a yield of 42·5 bushels per acre over the 50 acres of the competition area when harvested under the supervision of an officer of the Department of Agriculture. This is the first occasion on which the championship has been won in the Sea Lake district which first entered the championship competition in 1949.

Second place was awarded to Mr. N. W. Nalder of Meatian whose crop, also of Insignia, represented the Swan Hill Agricultural and Pastoral Society.

The yield of the winning crop comes very close to the record of 42·8 bushels per acre established in 1950 by Messrs. A. P. Murray and Sons of Nullawil.

Many yield records have been broken in the Mallee during the series of good seasons experienced there following the 1944–45 drought. A record average yield for the whole of the Mallee district of 16·1 bushels per acre was established in 1949–50 to be broken the following year with 16·2 bushels per acre. The average yield in 1951–52 was 15·4 bushels per acre and it is certain that a new record, probably exceeding 18 bushels per acre, will be confirmed when the 1952–53 average is computed. The average yield for the last four years is therefore about 16½ bushels per acre compared with an average of 8·4 bushels per acre in the ten years to 1948–49.

The outstanding features of the 1952–53 season were the unbroken period of useful rainfall from April to August inclusive followed by a dry September. In this dry period, some forward crops became frosted and, though the over-all loss was not great, individual farmers in some districts suffered heavily. The adverse effects of the dry September were largely overcome in October and November when good rains provided finishing conditions conducive to high yields of grain of a good sample.

THE COMPETITION

The following wheatgrowers represented their respective districts in the final judging for the championship :—

District.	Number of Crops in Local Contest.	Representative in Championship.	Variety.	Certified Yield.
				bus./ac.
Sea Lake	29	J. W. Ballantyne	Insignia	42·5
Swan Hill	18	N. W. Nalder ..	Insignia	..
Nullawil	9	W. J. Watts ..	Insignia	..
Hopetoun	6	A. J. Chivell ..	Insignia	..

The champion crop showed the benefit of the good growing season. It was fairly tall for the variety, but stood well and was very well headed, most heads filling three grains wide. Evenness and freedom from disease were good, but points were lost for some wild mustard and for tall strangers which detracted from the appearance of the crop. The Insignia itself was true to type.

The land on which the winning crop was grown is a heavy red clay loam showing a little ironstone. It was fallowed at the beginning of August, scarified in October, spring-toothed in late March with light harrows behind and sown in early May using 58 lb. per acre of

Mr. J. W. Ballantyne, Sea Lake, harvesting his crop of Insignia which yielded 42·5 bushels per acre.

Frosted wheat heads showing various types of damage.

copper-pickled seed and 60 lb. per acre of superphosphate. The land has been cropped on a fallow-wheat rotation for some years.

Mr. Nalder's crop, which gained second place, was grown on much lighter land than that carrying the winning crop. The paddock has been farmed on a four-course rotation of fallow, wheat, oats (grazing and recovery), pasture. Fallowing took place in June, 1951, after which it was scarified in July, springtoothed in October and tandem-disced in March. The land was seeded in the first week of May with 55 lb. per acre of mercury-pickled seed and 50 lb. superphosphate.

FROST INJURY OF WHEAT

Losses due to frost injury of wheat crops fortunately are a comparatively rare occurrence in Victoria and it is only in exceptional circumstances that crops are seriously frosted. In New South Wales frost injury is stated to be a common source of yield losses in wheat crops, and losses from year to year from this cause are more consistent than losses from diseases such as rust and smuts.

As mentioned previously, the total loss in Victoria from frost injury last season is not thought to have been great; nevertheless a number of individual farmers suffered heavily and reports of loss were received from districts as far apart as Underbool in the west, Ultima in the east, and Culgoa in the south. Frost was definitely established as the cause of losses in some districts outside the Mallee and it is possible that frost is responsible for some of the damage commonly attributed to root diseases which cause "deadheads" or "whiteheads" in wheat crops.

The wheat plant may be frosted at any stage from germination until the grain is well developed, but it is most susceptible at the pre-heading and flowering stages. In a normal winter, the fairly frequent occurrence of frosts serves to harden the wheat plant and a severe frost then has little injurious effect. In 1952 the autumn rains encouraged early seeding of early maturing varieties and the mild, almost frost-free winter promoted lush vegetative growth.

When the dry period occurred in September, many crops were at their most vulnerable stage and condition. Frost injury is most severe in early maturing varieties sown early and favoured by good growing conditions so that they come into ear before the danger from spring frosts is past. Injury is greater when soil conditions are dry and in crops growing on low-lying land or on the lower parts of undulating land.

Symptoms of Frost Injury

Symptoms of frost injury may be seen in the leaf, stem, and head of the plant.

Leaf—

Leaves appear distorted, blighted, parched and brittle, with in-rolling of the margins of tip frosted leaves.

Stem—

The lower nodes and internodes show a characteristic browning as well as buckling, splitting, and blistering. There is often a white ring-barking of the stem, frequently accompanied by bareness at the base of the ear.

Head—

The head may be completely bleached with no grain developed or only partially frosted when any portion of the ear may be bleached and shrivelled. A number of frosted heads are illustrated in the photograph.

There are no wheat varieties which are immune to frost but, as a general rule, the later maturing varieties, because of their more prostrate early growth and later maturity suffer less than early maturing varieties. The occurrence of frost damage is so infrequent that it is not considered necessary or advisable to delay sowing in order to avoid the remote possibility of frost injury in the spring. However, where two varieties of wheat, one later maturing then the other, are being grown it is advisable to sow the later maturing variety first. The best way to use frosted wheat is to cut it for hay as early as possible after the damage has occurred.

SMUT DISEASES OF CEREALS

Ball Smut

Of the several well known and commonly occurring fungus diseases which may attack the wheat plant, the one most readily controlled by the farmer is ball smut, also known as stinking smut or bunt. The treatment of seed for sowing to control this disease is now standard practice and it is rare indeed to find the farmer who has not dusted or otherwise treated his seed for ball smut. Almost every season, however, cases of smut-infested crops are encountered by judges of wheat crop competitions. In most cases, infection is light and the owner has been completely unaware of the presence of the disease.

Ball smut is a fungous disease carried on the seed, and its appearance in the crop cannot be attributed to any cause other than faulty pickling and usually insufficient care when pickling.

Prior to about 1925, the standard method for the control of ball smut was by the use of bluestone or formalin solutions. These methods were effective, but the grain could not be stored for long after pickling, and germination was sometimes affected.

The dry pickling method of pickling seed has now superseded the wet pickles. This treatment is simpler than the older methods and involves the mechanical dusting of the seed with copper or mercurial compounds. Dry pickled seed can be stored for indefinite periods, or sown on a dry seedbed if necessary.

Most of the brands of copper or mercurial dry pickling compounds will normally give an effective control of ball smut provided a dressing of 2 oz. of pickle per bushel is used and thoroughly dusted on so that each grain receives a protective coating. The two commonest faults are the application of insufficient pickling powder and speeding-up of the operation so that the grain and the powder are not thoroughly mixed.

The range of pickling powders available has been widened by the introduction of new pickles containing hexachlorobenzene (H.C.B.) as the bunticidal agent. These powders are now sold under various trade names. Experimental work conducted by the Department of Agriculture over the past four years has shown that powders containing not less than 10 per cent. of hexachlorobenzene, applied at the rate of 2 oz. per bushel of seed, are at least as effective as similar dressings of mercurial or copper pickles for the control of bunt in wheat.

Other Smut Diseases

The various smut diseases of cereal crops are :—

(*a*) Wheat—Ball smut, loose smut, flag smut.

(*b*) Oats—Loose smut, covered smut.

(*c*) Barley—Loose smut, covered smut.

In all these smuts, except flag smut, the grains of the head are replaced by masses of black spores. Flag smut, as the name implies, primarily affects the leaves of the plant. In the covered smuts, the black spores are still enclosed by the outside " skin " of the grain, while in the loose smuts the spores are not enclosed, and after they blow away the bare rachis or " backbone " of the head is left.

Most of the smut diseases can be controlled or reduced to negligible proportions if simple precautions are taken. All of the wheats released by the Victorian Department of Agriculture in recent years are resistant to flag smut, and as these varieties are sown on over 90 per cent. of the wheat acreage in this State, flag smut is now of little importance.

Oat and barley crops are commonly sown with unpickled seed, and many farmers are not aware that both the loose smut and covered smut of oats and also the covered smut of barley can be controlled by dry pickling the seed with mercurial powders in the same way as for wheat. The mercurial powders are more effective than the copper powders for oats and barley and H.C.B. is not advocated for the control of smuts in these two cereals.

As the spores of loose smut of wheat and loose smut of barley are inside the grain, these particular smuts cannot be controlled by any of the pickling powders, and selection of seed from crops known to be free of these smuts is the most practicable means of reducing losses from these two diseases.

Mr. J. W. Ballantyne in his crop of Insignia which gained the Mallee Championship.

Mallee Competition Winners.

Winners of the Mallee Wheat Crop Championship since its inception in 1939 are as follows :—

Mallee Wheat Crop Championship Winners, 1939–52.

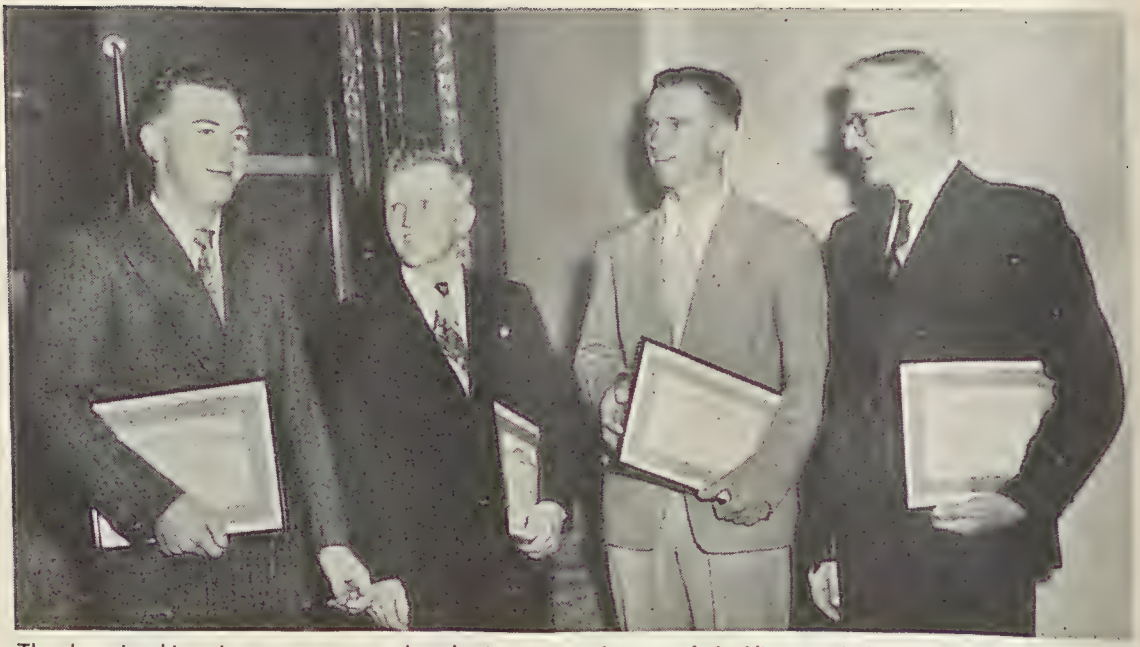
Year.	Winner.	District.	Variety.	Certified Yield.
				bus./ac.
1939	G. S. Mahar	Kerang	Ghurka	36·0
1940	C. E. Carra	Hopetoun	Ghurka	24·2
1941	C. E. Carra	Hopetoun	Bencubbin	31·0
1946	F. J. Hofmaier	Beulah	Bencubbin	28·5
1947	Mrs. A. Olson	Swan Hill	Quadrat	33·1
1948	M. W. Gniel	Beulah	Bencubbin	32·8
1949	W. A. Jones	Nullawil	Insignia	38·3
1950	A. P. Murray and Sons	Nullawil	Insignia	42·8
1951	Mrs. F. J. Hofmaier	Hopetoun	Pinnacle and Insignia	39·9
1952	J. W. Ballantyne	Sea Lake	Insignia	42·5

THE NORTHERN DISTRICTS CHAMPIONSHIP

Report of the Judge, H. C. H. Watson, B.Agr.Sc., District Agricultural Officer

For the second successive season, wheat-growers in the northern districts experienced very wet conditions during the winter and spring, and on the heavier soils many areas were water-logged for considerable periods, resulting in some unevenness in the crops and a certain amount of lodging. The lighter textured soils with good drainage did not suffer to the same extent and, in some districts, gave considerably higher yields than the more fertile but poorer drained paddocks.

A wide range of soil types, rainfall and farming conditions are encountered in the large area covered by the Northern Districts



The championship prizes were presented at the Annual Conference of the Victorian Wheat and Wool Growers' Association. Left to right—Mr. R. Ballantyne (representing his brother) Mallee; Mr. C. Douglass (John Douglass and Sons), Northern Wimmera; Mr. M. Longmire, Southern Wimmera; Mr. J. Henderson (representing his son), Northern Districts.

Championship, and in favorable seasons, the higher rainfall localities with their capacity, both inherent and acquired by improved farming methods, to produce high yielding crops have usually taken the championship honours. The change in seasonal conditions, which has enabled lighter rainfall areas to win the championship, maintained and stimulated interest in the competition.

Wheat crop competitions in the Northern districts were conducted by seven agricultural societies during 1952, a total of 54 crops competing in the various sections and seven were judged in the championship final.

THE CHAMPION CROP

The championship was won by Mr. J. S. C. Henderson of Baulkamaugh, representing the Numurkah Agricultural and Pastoral Society. The variety shown was Pinnacle and a certified yield of 48·0 bushels per acre was harvested from an area of 51½ acres.

The paddock was new land which was mould-board ploughed in July, harrowed in September, cultivated and graded in March and sown with the combine in May using 60 lb. each of seed and superphosphate per acre.

NORTHERN DISTRICTS CHAMPIONSHIP ENTRIES, 1952.

Name.	Address.	Agricultural Society.	Variety.	Certified Yield.
				bus./acre
J. S. C. Henderson	Baulkamaugh ..	Nurmurkah ..	Pinnacle	48·0
J. Dunne	Springhurst ..	Rutherglen ..	Pinnacle	45·8
A. J. Gall	Cosgrove ..	Dookie	Quadrat	..
W. J. Cain	Carisbrook ..	Maryborough ..	Pinnacle	..
W. Kay and Sons	Kialla	Tatura	Magnet	..
W. C. Stewart and Sons ..	Tarrawingie ..	Wangaratta ..	Pinnacle	..
R. J. Bruce	Rennie	Yarrawonga ..	Quadrat	..

The crop was very even for one on new land and was true to type and free from disease. Some shedding of grain had occurred through storm damage just prior to harvesting.

COMMENTS ON OTHER CROPS

Second place was gained by Mr. J. Dunne of Springhurst who also showed a crop of Pinnacle. This crop, which yielded 45·8 bushels per acre, was grown on an area of sandy loam adjacent to a creek which provided excellent drainage for the land. The paddock, which had been under sown clover pasture for five years since the previous crop, was cut for grass hay in 1951, disc ploughed the second week in April, harrowed and sown one week later. Quantity of seed and superphosphate were 70 lb. and 90 lb. per acre respectively.

Other entries in the championship had slightly lower yields and, in some instances, carried more weed growth and were not so even as the leading entries.

Finalists in the 1952 Northern Districts Championship are shown in the table on the previous page.

WHEAT VARIETIES

In the various sections of the competition, eight varieties of wheat were exhibited, over 80 per cent. of these entries comprising Pinnacle, Quadrat, Baldmin, and Insignia. There were considerably more Pinnacle and Insignia entries than in former years, and it is anticipated that the latter variety will prove very satisfactory in the western section of the district, particularly when drier seasons are experienced.

Changes in the acreages sown to the leading varieties in the Northern Districts in recent years are shown in the table on this page.

The main trends indicated are the decline in the acreages under Quadrat and Magnet and the rapid expansion of areas sown to Pinnacle and Insignia.

NORTHERN DISTRICT—MAIN WHEAT VARIETIES GROWN.

(Expressed as a percentage of the Northern District acreage.)

Variety.	1952.	1951.	1950.	1949.	1948.
	%	%	%	%	%
Quadrat ..	42·1	43·9	44·9	52·5	52·5
Pinnacle ..	21·4	17·5	13·3	5·8	4·7
Insignia ..	14·5	10·6	8·8	7·1	1·9
Baldmin ..	7·3	8·5	6·3	4·9	4·1
Magnet	5·8	7·5	12·1	10·9	13·1
Pindar	1·9	1·6	1·6	2·0	2·2
Bencubbin ..	1·8	2·2	2·7	2·8	3·2
Ghurka ..	0·9	1·5	2·0	3·8	9·5
Diadem ..	0·8	1·2	2·7	3·9	1·5
Gabo	0·7	0·9	1·0	1·6	0·5

RATE AND TIME OF SEEDING

Both experience and experiment have shown that on most soils of the northern districts best returns are obtained from wheat crops sown during May provided the land is in good order and reasonably free of weeds.

Farm mechanization has enabled seeding operations to be speeded up considerably, and the majority of wheatgrowers are now able to sow their crops at the optimum time. Trials have shown that there is little difference in the yield from crops sown during May at 50, 75, and 100 lb. of seed per acre, and that a suitable amount of

The Deputy Chairman of the Farm Competitions Association, Mr. W. B. Miller, presenting the certificate for the Northern Districts Championship to Mr. John Henderson, father of the winner.

seed for normal, clean land is from 60 to 70 lb. per acre. For later sowing, better yields may be expected from somewhat heavier seeding rates.

LEY FARMING ASSISTS WEED CONTROL

Judges of the local competitions commented that the majority of crops were comparatively free from weed growth and disease infestation. This can be attributed to some extent to the widespread adoption of the ley farming system of farm management. Not so many years ago, it was common to work wheat farms in the area on short rotations such as fallow–wheat or fallow–wheat–oats, and wild oat infestations in wheat crops were generally heavy and take-all patches were frequently met.

In the localities where it has been possible to introduce subterranean clover pastures for several years, the incidence of weed growth and also of disease has been greatly reduced. However, last year it was noticeable that the worst take-all paddocks were those which had been cropped after a period of volunteer pasture in which the naturally occurring species were spear grass, barley grass, and silver grass, all of which are subject to take-all, and help to propagate the fungus from year to year. If the vegetation on a paddock during the ley period is of this type and does not contain subterranean clover, particular care should be taken, when preparing such paddocks for cropping, to fallow them carefully and keep them clean of weed growth.

In the past, clover-ley farming has been mainly on areas having an annual rainfall of more than 21 inches. The availability of earlier maturing varieties of subterranean clover has considerably widened the scope for the application of the clover-ley system of farming in the northern districts. Under this system, cropping is undertaken after the land has been under pasture, containing subterranean clover, for a number of years. In the higher rainfall areas, wheatgrowing after such a pasture can be successfully carried out on non-fallowed land, but in the lower rainfall sections a fallow period is required.

Northern Districts Wheat Crop Championship Winners, 1946–52.

The winners of the Northern Districts Championship since inception of the competition seven years ago are set out in the table below.

Year.	Name.	Agricultural Society.	Variety.	Certified Yield.
				bus./acre
1946	T. Klemm, Londrigan	Wangaratta	Magnet	50·2
1947	J. Dunne, Springhurst	Wangaratta	Magnet	39·8
1948	R. W. Thomas, Dookie	Dookie	Baldmin	63·7
1949	R. W. Thomas, Dookie	Dookie	Baldmin	46·3
1950	James Bros., Dookie	Dookie	Baldmin	41·7
1951	L. Lawrence, Katamatite	Numurkah	Quadrat	37·5
1952	J. S. C. Henderson, Baulkamaugh	Nurmurkah	Pinnacle	48·0

TUBERCLE-FREE DAIRY HERDS

ACCREDITED TUBERCLE-FREE HERDS

The following dairy herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual, physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive, physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Breeds of Cattle comprising the below-mentioned herds are as follows:—

A.A., Aberdeen Angus; A.I.S., Australian Illawarra Shorthorn; Ayr., Ayrshire; D.Sh., Dairy Shorthorn; F., Friesians; G., Guernsey; J., Jersey; P.H., Poll Herefords; R.P., Red Poll; Sh. Shorthorn.

Name.	Address.	Breed.	Number in Herd.
Aboriginal Station ..	Lake Tyers ..	J.	152
Alberni Bros. ..	Ferntree Gully ..	Sh.	80
Ampt, E. W. ..	Gymbowen ..	Ayr.	7
Anderson, G. R., and Son	Toolern Vale ..	J.	57
Assumption College ..	Kilmore	F.	34
Atkinson Bros. ..	Swan Hill ..	D.Sh.	160
Attrby, H. A., and Son	Hamilton ..	J.	22
Ballarat Orphanage ..	Ballarat	J.	105
Beattie, W. P. ..	Katandra West ..	J.	57
Beer, W. G., and Sons	Nanneella ..	R.P.	108
Beggs, A. R. ..	Beaufort ..	R.P.	61
Bleakey Bros. ..	Horsham	D.Sh.	26
Boardman, Mrs. E. G.	Alvie	J.	81
Bott, J.	Yarrawonga ..	A.A.	134
Bradbury, H. A. ..	Mooroopna ..	G.	42
Brahm, C. H., and V. I.	Mirboo North ..	J.	68
Buchanan, J. M. ..	Flinders	Ayr.	69
Bunn, A. A. ..	Tatura	Ayr.	115
Burgman, F. A. ..	Katandra West ..	J.	108
Burley, H. ..	Mortlake ..	J.	50
Callahan, Philip ..	Barwon Downs ..	D.Sh.	66
Candler, G. E. ..	Coleraine Road Farm, Hamilton	F.	241
Calvert, N. M. ..	Neerin Neerin ..	G.	23
Carne, W. J. ..	Pakenham Upper ..	J.	42
Carson, M. E. ..	Irrewillipe East ..	J.	144
Cason, J. M. ..	Lima South ..	J.	73
Charles, R. C., and Sons	Glenburn ..	H.	91
Charlton, G. F. ..	Stoney Creek ..	J.	55
Chrnside, R. G. ..	Skipton	J.	74
Christy, W. A. ..	"Burwill," Echuca Village	J.	46
Clark, P. W., and Son	Whittlesea ..	J.	87
Clark, W. J. ..	Monomeith ..	J.	103
Clarke, R. C. N. ..	Seymour ..	A.A.	139
Cornell, J. ..	Gunbower ..	G.	72
Coolamungle Prison Camp	Timboon ..	R.P.	41
Cother, A. E. ..	Binnum	F.	54
Cowan, G. L. S. ..	Bacchus Marsh ..	F.	54
Cox, A.	Girgarre ..	J.	123
Cox, F. G. ..	South Lyndhurst ..	J.	55
Cox, G., and R. ..	Murraydale ..	J.	98
Cribbs, T. A. ..	Wangaratta ..	J.	50
Cunnington, R. ..	"Grantham," Bamawm	R.P.	74
Dees and Gibson ..	Woori Yallock ..	A.I.S.	61
Davies, M. and L. ..	"Fine View," Dimboola	Sh.	20
Dering, J. T. ..	South Wangaratta	J.	97
De La Rue, N. C. ..	Tomahawk Creek ..	J.	57
Dennis, D. J. A. ..	Terang	A.A.	69
Dixon, Mrs. E. ..	Research ..	D.Sh.	63
Dookie College ..	Dookie	Ayr.	127
Dookie College ..	Dookie	P.H.	74
Doogall, J. K. ..	Hastings ..	J.	48
Drechsler, W. P. ..	Swan Hill ..	J.	65
Dwyer, Mrs. F. W. ..	Ardmona ..	J.	47
Dymster, H. R. ..	Moyston	G.	31
Eagle, W. H. ..	Yarram	J.	59
Emmett, Mrs. S., and Sons	Stanhope ..	J.	69
Everist, P. ..	Tyabb	A.A., R.P.	29
Faence Bros. ..	Warrnambool ..	F.	203
Fidler, F. W. ..	Werribee ..	F.J.	45
Finch, F. M. ..	Beaufort ..	D.Sh.	8
Fixter, A.	Boisdale	G.	20
Foletta, G. G., and Son	Buxton	Ayr.	188
Fyfe, Mrs. P. S. ..	Berwick	G.	5
Gilbert, J.A., and R. D.	Yinnar South ..	J.	110
Gleeson, P. J., and Son	Tynong	J.	155
Goddard, James H., and Sons	Cora Lynn ..	Ayr.	107
Gorman, A. W. ..	"Cathcart," Alexandra	Ayr.	94
Graves, L. J., and A. L.	Battery Park, Mansfield	A.A.	125
Griffiths, J. G. ..	Benalla	D.Sh.	114
Gross, Mrs. G. F. ..	Green Lake, via Horsham	J.	24
Hamilton, A. ..	Flinders	Ayr.	79
Harrison, B. ..	Hamilton ..	F.	45
Hartwick, J. P. ..	Hamilton ..	Ayr.	42
Haywood, Dr. A. R.	Hastings ..	J.	21
Hearn, Miss I. K. ..	Rochester ..	G.	92
Hicks, E. J., and Sons	Echuca	J.	106
Howell, G. G. ..	Wollert	P.H.	94
Howlett, E. and G.	Lang Lang	J.	117
Ivone, M., and Sons	Ovens	J.	143
Jackson, H. ..	Lockington ..	J.	45
Johnson, F. T. ..	Horsham	J.	36
Jones, A. C. ..	Barnawartha ..	A.I.S.	154
Jowett, Capt. A. C...	Clonbinane ..	R.P.	69
Keele, H. A. ..	Bamawm ..	J.	63
Kelynack, P. T. ..	Bundoora	J.	88
Kemelfield, J. ..	"Wongala," Woodend	Sh.	88
Kemp, E. J.	Horsham	Sh.	11
Kerr Bros.	Bacchus Marsh ..	Sh.	33
Kilpatrick, B. A. ..	Mernda	J.	66
Klemm, H. F. ..	Londrigan ..	J.	84
La Fontaine, G. ..	Mitta Mitta ..	J.	63
Light, D. T. ..	Noradjuha ..	J.	10
Longerenong Agricultural College	Dooen	Ayr., P.H.	82
Lorimer, C. O. ..	Ocean Grove ..	R.P.	56
Ludeman, L. C. ..	Ayrford, via Timboon	J.	120
Luke, K. G. ..	Romsey	P.H.	79
Maloney, P. J. ..	Tongala	J.	77
Maybery, A. H. ..	Mitre	D.Sh.	14
McCombe Bros. ..	Horsham	D.Sh.	133
Meaklim Bros. ..	Mooroopna North ..	D.Sh.	59
Middleton, H. ..	Lower Ferntree Gully	Sh.	23
Middleton, J. A. ..	Labertouche ..	F.	97
Millman, A. J., and Son	Colac	F.	111
Murphy, J. J. ..	"Glen Vale," Lang Lang	Ayr.	47
Myers, J.	Myrniong ..	D.Sh.	88
McCallum, W. J., and Sons ..	Tatura	J.	86
McCormack, M., and Sons	Mansfield ..	R.P.	127
McIlroy, B. ..	Edi	J.	138
McIntosh, J. ..	Merrigum ..	R.P.	85
McKenzie, E. ..	Wandella, via Kerang	J.	75
McKenzie, Mrs. E. J.	Woodford ..	J.	65
Mackenzie, H. P. ..	Trawalla ..	J.	33
McMillan, W. ..	North Mooroopna	G.	62
McNabb, G. A., and Son	Irrewillipe East ..	J.	145
McPherson, A. L., and J. J.	Kyneton ..	D.Sh.	98

TUBERCLE-FREE DAIRY HERDS—*continued*

Name.	Address.	Breed.	Number in Herd.
Nancarrow, E. J.	Kerang	J.	28
Nankervis, A.	"Wattle Grove" Wooragee	J.	143
Newton, J. M., and Sons	Whoroully	A.I.S.	101
Newton, J., and W.	Tarrawingie	J.	81
Nicholas, M. A.	Sherbrooke	J.	77
Nicholson, Mrs. L. E.	Banyule Stud, Yarra Glen	J.	142
Noonan, Mrs. S. A.	Benalla	J.	50
Norris and Nevett	Dixon's Creek	J., G.	77
Northcote Children's Farm	Bacchus Marsh	J., Sh.	85
Palmer, E. H., and N. B.	"Dalvui," Terang	J.	204
Payne, A. E. T.	Lilydale	G.	89
Payne, T. E. N.	"Woodburn," Kilmore	R.P.	77
Pelchen, E., and F.	Moutajup	Ayr.	16
Perry, W. C., and L.	Buxton	Ayr.	43
Potter, W. J.	Longwarry North	F.	136
Prosser, J. E.	Ondit	J.	42
Ralph, J.	Binnum	D.Sh.	142
Read, I. D., executors of estate	Springhurst	J.	94
Richardson, W. S.	Bayswater	J.	13
Ritchie, R. B., and Son Pty. Ltd.	Penshurst	J.	144
Rix, A. A.	Officer	J.	66
Robinson, T. W.	"The Ranch," Warracknabeal	J.	34
Rutherglen Research Station	Rutherglen	J.F.	71
School of Horticulture	Burnley	J.	2
Scott, A. L.	"Wolonga," Kongwak	J.	55
Selwyn-Scott, F. E.	Scotsburn	D.Sh.	77
Sewell, Estate of Sir Sydney	Berwick	G.	72
Shanahan, G.	Myrniong	D.Sh.	126
Smith, L. J.	Lower Norton	R.P., J.	4
Smith, R. A.	Bundoora	F.	80
Speirs, A. E., and Sons	Nalangil	Ayr.	62
State Research Farm	Werribee	R.P., F.	291
Stephens, Dr. F.	Vermont	G.	32
Stokes, R. N.	Millgrove	D.Sh.	70
Taylor, J. M.	Mooroopna	Sh.	36
Thompson, H. D. L.	Merricks	J.	59
Till, J. A.	Tongala	J.	59
Tucker, E. G.	Horsham	D.Sh.	29
Uebergang, E. A.	"Sunnyhurst," Natimuk	D.Sh.	16
Walker, C. and Son	Macedon	J.	45
Ware, J. G., and Sons	Lower Gellibrand	G.	32
Warnock, J. A.	Lima South	J.	142
Waterhouse, J. H.	Pakenham	J.	88
Watson, R. G.	Frankston	G.	38
White, F.	Warrenbayne	J.	42
White, J. E. B.	"Challicum," Buangor	J.	18
William's Victorec Farms	Dalmore	A.A.	54
Williamson Bros.	Carisbrook	Sh.	162
Wilson, Alan	Tongala	J.	47
Wilson, J. C.	Gnotuk	A.A.	109
Wilson, J. L.	Koo-wee-rup	A.I.S.	105
Woodyer, P. A.	Bittern	J.	22
Woori Park Pty. Ltd.	Pakenham	G.	67
Young, N.	Whittlesea	J.	86

In addition to the above, the following is a list of herds in their respective districts which have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the Accreditation Scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

District.	Herds.	Cattle.
Ararat	9	254
Bairnsdale	7	441
Ballarat	81	2,770
Benalla	7	128
Bendigo	62	2,881
Berwick	41	1,461
Broadmeadows	96	3,844
Buln Buln	1	130
Colac	5	187
Cranbourne	12	538
Creswick	4	95
Doncaster	18	740
Eltham	6	340
Geelong	111	4,535
Hamilton	11	499
Heidelberg	39	874
Heytesbury	2	113
Horsham	12	419
Kerang	3	101
Mornington Peninsula	131	3,576
Morwell	4	305
Portland	18	680
Rutherglen	16	413
Sale	10	674
Stawell	8	253
Swan Hill	4	195
Terang	2	73
Wangaratta	5	305
Warragul	60	3,189
Warrnambool	8	260
Whittlesea	194	7,696
Wonthaggi	12	732
Woorayl Shire	21	1,342
Yarragon	31	1,696
Yea	34	72

There are also 1,461 herds, in which 63,594 head of cattle have passed one test and may be considered, therefore, to be in process of becoming tubercle-free herds.

Garden Notes for May

By GEORGE HYAM, Horticultural Supervisor

THE FLOWER GARDEN

Propagating Roses from Cuttings.

THE present cost of nursery raised rose plants and their comparative scarcity, has turned the attention of home growers who desire to plant a quantity—as for instance, for a rose hedge or a border of polyanthas—to the possibility of propagating their own plants.

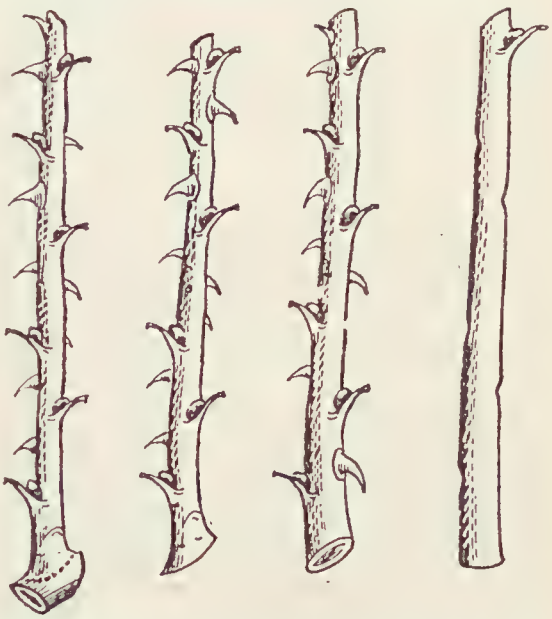
Roses can be propagated by three methods ; by budding on to suitable rooted stocks ; by layering ; and by rooted cuttings. Budding is essential for standard roses to obtain their tall bare stems, but budding is by no means necessary for all varieties which are to be grown as dwarf or bush roses or as climbers.

The original and main object of budding was to provide a more vigorous root system for varieties which are rather weak growers but propagation by rooting cuttings is quite satisfactory for any of the more vigorous varieties. This method was the most common form of propagation 30 or 40 years ago and is still used to some extent by nurseries for certain kinds.

If the proper kind of cutting is taken and put down at the right time (and provided that the variety is sufficiently vigorous in habit ; and this would include most of the garden roses other than those which are generally termed exhibition roses), a rose plant on its own roots is quite as vigorous and prolific in flowering and often longer-lived than the same variety budded on to dwarf stocks. There are, however, a few exceptions even amongst some of the vigorous kinds. These are mainly the Pernetiana roses such as Golden Emblem or Madame Edouard Herriot or some of the modern roses which have a pernetiana strain.

Roses which do as well or better on their own roots are Lorraine Lee, Sunny South, Shot Silk, Ophelia and Radiance. Practically all polyantha roses and floribunda or hybrid polyanthas are better on their own roots than if budded.

Catalogues of roses and books on rose culture generally indicate the vigor or otherwise of the different varieties and whether they are pernetianas or not. These can be used as a guide as to whether or not it is worthwhile propagating by cuttings.



Left—Cutting taken from plant with heel of older wood. Left Centre—Cutting prepared for planting. Right Centre—Cutting of young wood from Manetti ("Maiden's Blush") for budding dwarf roses. Right—Cutting for budding prepared for planting—thorns and lower eyes have been removed. *[After B. V. Rossi.*

All natural climbers, which are those varieties whose names are not prefixed with the word "climbing," can be satisfactorily rooted from cuttings as well as many of the climbing strains of ordinary varieties but climbers of all kinds are perhaps better propagated from layers which may be put down in the usual way in mid-summer.

The method of rooting cuttings of species which are to be budded later are taken and put down in the same way and at the same time for budding the following summer or autumn, after they have rooted. Budding is not difficult but the home gardener rarely has access to the proper species used for stocks. These are usually, the *Rosa canis* for standards and the Manetti or "Maiden's Blush" for dwarfs and climbers, though some others are occasionally used.

Cutting Wood Should be Carefully Selected and Prepared.

Although it is possible to root a percentage of almost any kind of rose wood which is not too old, a good deal depends on the nature of the wood to be used for cuttings as to whether the resultant plant will be vigorous and symmetrical. The time such wood should be taken and put down is also another important factor, especially in regard to the percentage that will root properly. The best period for taking and laying down cuttings is from April to June and the best cutting is a stem which has grown and flowered since February with a heel of wood that has been formed during the previous spring, but it should be not more than nine months old. The young wood must be well hardened however.

The top portion near the flower stem, which has the smaller leaves, should be cut off to a point just above an adult leaf and so that the cutting is not less than 6 inches or more than 9 inches long. The heel of older wood is pared to a thin sliver. All leaves are then cut off.

If cuttings are to be brought from a distance, they must be prevented from drying out by being wrapped individually in damp newspaper or moss and, if to be held before planting out, they should be stood in water. Wilting must be avoided otherwise the cuttings will fail to root.

Striking the Cuttings.

Roses are one of the plants which have responded very well to hormone rooting compounds used in accordance with the various makers' directions. As noted before, these have the effect of "speeding up" callusing and subsequent rooting on plants like roses which respond readily to them but do not dispense with the necessity for care in selecting, preparing and planting out untreated cuttings.

It is not advisable to wait until pruning time to take cuttings, as they are more likely to callus before rooting if put down before the soil gets too cool. On the other hand, wood for cuttings is seldom "ripe" enough before the end of March.

Ordinary sandy or loamy soils in open beds are quite suitable for rose cuttings. Heavy soils should be made more friable with sand or sawdust, but not with compost unless it is completely rotted. No active manure or fertilizer of any sort should be allowed to contact the cuttings.

Plant 4 to 5 inches deep and ram them in very tightly. There is usually a small percentage of loss but this can be reduced to a minimum if the ground is kept moist but not over-wet at all times. The cuttings have no roots from which to draw moisture from a distance and without hormone treatment they do not make much root for the first six months. Consequently, lack of sufficient moisture during the early stages is generally the cause of loss.

The production of the first leaves is no indication of rooting, as these can be produced by the stored-up sap in the cutting and they will quickly die if the soil becomes dry or even partially so. Cuttings therefore require more frequent watering than rooted plants.

Plants should be spaced about 9 inches in the nursery row and left to grow on for twelve months before planting-out. No growth is lost by this and it gives an opportunity of producing a shapely plant by nipping out any misplaced shoots. The young plants should be protected from aphis by the usual DDT or B.H.C. sprays, and they may be fed with a light top-dressing of some complete fertilizer in the following January or February, but fertilizer or manure applied before this stage is risky. In hot, dry districts, a surface mulch laid before the summer is advisable.

THE VEGETABLE GARDEN

Preparing for the Spring Planting Season

May is a somewhat slack time in the vegetable garden, but it is the best time to do some quite important jobs, most of which are preparatory to the spring planting season. At this time, all summer crops finish and there is a considerable amount of vacant space. The small May plantings which are mainly of early onions and spring cabbage and late cauliflower or sowings of peas in northern areas, will generally leave beds which will not be required until about the end of July. This gives an opportunity of getting such beds into good heart and at the same time let them benefit by a period of fallow during the next two or three months.

In a good system of garden rotation such a resting period can be given to all beds every second or third year to their considerable benefit.

For such areas, the finished summer crops should be removed as soon as possible so that the ground can be dug over. The old plants are better taken to a compost heap rather than dug in direct as they will be a more valuable addition to the ground when this is done. This also applies to any summer weed-growth. In cold and wet districts, it is doubtful whether green vegetable matter will completely rot down in the soil in time, to be fully available to the first sown spring crops. Although the heat of a compost heap is often said to be sufficient to kill disease spores by the process of the heating which takes place therein it is certainly not sufficient to sterilize material at the sides where there is little heating. Consequently, it is much safer not to use vegetation from diseased plants on the compost heap, but to burn it and apply the ashes.

Many home gardeners make the mistake of digging during the winter when the soil is too wet. If this is done its texture can be spoilt. In most districts, however, the weather is sufficiently dry during May to permit this cultivation to be done with safety.

At this time it is best to leave the surface in ridges, not necessarily regular or symmetrical, though a good digger can do this, but to aim at leaving as much of the soil as possible exposed to air, rain and winter frosts while it is lying fallow. In other words, leave the surface as rough as possible and unbroken or unraked to a level suitable for immediate planting.

Lime Should be Applied in Early Winter

All vegetable plots with the possible exception of those which are to be planted with an early potato crop, should receive an annual dressing of lime each winter. For general use, to maintain the calcium content and to correct any normal build-up of acidity during the previous season, agricultural lime (ground limestone) is the best form to use as its effects last longer. Hydrated lime is best only where it is necessary to supply calcium or to correct acidity quickly at other seasons of the year. The quantities to apply of course vary according to soil conditions but usually, ½-lb. per square yard is satisfactory for an annual dressing with perhaps twice that quantity on soils where liming has been neglected for some years.

One point to bear in mind is that, where unusually large quantities of animal manure have been applied or sulphate of ammonia used very heavily, the soil will have a higher acid content, and may need a heavier dressing. The lime should be spread over the surface after digging so that rains will gently diffuse it through the soil. Digging in lime so as to turn it under the bottom spit is placing it where it is least wanted. Lime can also be applied around growing winter crops at this time and such applications are better than waiting until these crops finish.

Manuring in Winter Time

As a general rule, the application of animal manure or compost on ground dug over in May is best deferred until a week or two before planting in spring. In the first place, it is not good practice to apply organics too soon after lime dressings and is not readily incorporated into the soil in cold weather. Furthermore, the inorganic contents which are largely in a readily soluble form, are apt to be leached out by heavy rains before the spring crops are able to take advantage of them. A light dressing of superphosphate spread over the surface a fortnight or so after liming will encourage heavier winter weed growth which, when dug or forked in just before spring at the same time as manure or compost, will add to the humus supply of the soil at that season.

The exception to this suggestion is that, for the purpose of making new plantings of rhubarb or asparagus where the organics should be placed under the roots, this should be trenched in now or before the roots are planted. Both can be planted from May until July.

If the beds which are to be planted with late cabbage and cauliflowers were not manured previously, placing the organics as a mulch will give better results than if dug in at this late stage.

During the winter and pending their use later, manure or compost heaps should be protected from heavy winter rains so that their soluble contents will not be leached away. Tarred paper such as is now used extensively for covering hay stacks will be found handy for this purpose and will last

for several seasons. The ends may be weighted by tacking strips of woods to them to keep the covers taut when over the heaps.

May Planting Reminders

In addition to cabbage, cauliflower, onion seedlings and rhubarb and asparagus roots mentioned above, the seed of Parisian cabbage can be sown in seed beds now. Broad beans and peas can be sown in the warmer northern areas together with Imperial D. or Webb's Wonderful lettuce in seed beds for transplanting. All vegetable bulbs—shallots, garlic or tree onions can still be planted and successional sowings of turnips can also be made in all districts. Perennial culinary herbs can be divided and replanted. Carrots, beetroot, and parsley may be sown in northern areas.

Book Review

RURAL AUSTRALIA—A Graphical Summary

Prepared and Published by the Bureau of Agricultural Economics, Department of Commerce and Agriculture, Canberra, A.C.T. Price, 21/-

The early part of the book is designed to show the general relationship of the Australian rural economy to the economy of the country as a whole. In effect, it presents a panoramic view of the basic rural industries and the general economic factors influencing their development.

The remainder of the book presents to the reader the principal features of each major rural industry in turn, the form of presentation allowing a rapid comparison to be made so that the relationships between the different industries can easily be seen.

Throughout the book greatest emphasis is placed on post-war developments (figures are, wherever possible, taken up to 1951–52) although in most cases comparison is made with the years immediately before the war. In some instances the story has been taken further back in order to facilitate interpretations of current trends.

"Rural Australia" is a valuable source book of authoritative information on our important rural industries. It should prove of considerable value to the high school, agricultural college, and university student, as well as to those engaged in any field connected with our rural economy.

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VICTORIA

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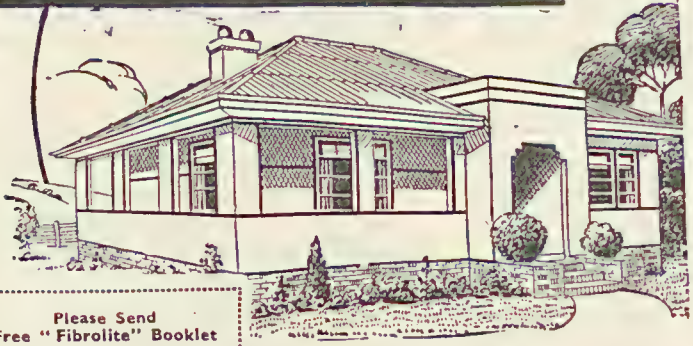

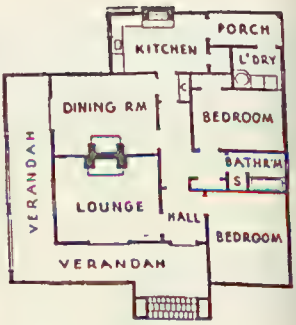

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Dairy Cattle Feeding Trials

Concentrates v. No Concentrates

By A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

FEEDING trials conducted by the Victorian Department of Agriculture during the past three years have shown that cows fed adequately on pasture, supplemented with grass-clover hay, produced milk and butterfat more economically than cows on pasture with concentrates as additional food. These trials, which were financed from Commonwealth Dairy Improvement Grant Funds, have been carried out in the four main dairying districts of Victoria. In each of these districts, three dairy farmers made their farms and herds available for the purpose of carrying out the experiments. In each case three feeding treatments were tested.

Each year and in every district, the cows in one herd received pasture and other home-grown foods, without any concentrate supplements. The cows in another herd were fed a half-ton of crushed oats or other low protein concentrate per cow per year as a supplement to pasture and home-grown fodders. In the third herd, the cows received a protein-rich supplement (linseed meal) in addition to the other foods. These feeding treatments were rotated around the herds each year.

At Rochester, in Northern Victoria, farms with medium-sized herds of about 40 cows grazed on irrigated pastures were selected. In the Kiewa Valley, three large farms with about 100 milking cows on each were selected. In West Gippsland, where much winter milk for the Melbourne retail trade is produced, medium-sized herds were selected near Warragul, and at Camperdown in the Western District also the herds were of medium size.

In all the districts above-mentioned, production on the test farms has increased since the trials commenced. This has been due to several factors—good seasons, better farming and improvements made during that time. The improvements have led to increased production, and on the twelve farms have included the construction of three haysheds and one implement shed. Other major improvements have been made to fences (including further subdivisional ones on eight of the farms), water supplies on four, and drainage on six. Six of the farmers purchased new tractors and, at the end of June, 1952, only two were dependent upon horses for their farm work.

With the purchase of tractors, the horses have been sold and extra cows have been purchased to take their place.

Two farms on which few major improvements had been carried out were sold during the course of the trials. One of the farms was sold on a walk-in walk-out basis and continued in the trials, but the other farm sold ceased to take part, as the cattle were dispersed and the new owner could not carry on with the trials. The management on a third farm has been affected by the decease of the owner. This farm is being operated by his widow and step-son. On one farm, during the year when no concentrates were to be used, the owner fed 100 lb. of concentrates per cow.

During the year prior to the commencement of the trials the twelve farmers delivered milk and cream containing a total of 169,781 lb. of butterfat to their respective butter factories. There were 650 cows milked, from which an average of 261 lb. of butterfat per cow was sold. On the average farm 54 cows were milked and 14,140 lb. of butterfat was sold. During this period concentrates varying from nil to 1,000 lb. per cow, and averaging 500 lb. per cow, were fed.

To 30th June, 1952, the various feeding treatments had been completed in ten of the herds, and it was found that, in the years in which no concentrates were fed, 7 per cent. more cows were milked and 4 per cent. more butterfat was sold from the herds than in the year prior to the commencement of the trials.

In those herds in which the cows were fed a half-ton of concentrates low in protein, 6 per cent. more cows were milked and 18 per cent. more butterfat was sold and in those herds where the cows received concentrates high in protein, 9 per cent. more cows were milked and 24 per cent. more butterfat was produced. The results are given in Table 1.

TABLE 1.—THE AVERAGE NUMBER OF COWS MILKED AND BUTTERFAT SOLD FROM FARMS DURING THE YEAR OF DIFFERENT FEEDING TREATMENTS.

Feeding Treatment.	Averages per Farm.		
	Cows Milked.	Butterfat.	
		Total Sold.	Increase Over No Feeding.
	No.	lb.	lb.
Prior to trials	54	14,140	..
No concentrates ..	58	14,706	..
Low protein concentrates, ½ ton per cow ..	57	16,685	1,979
High protein concentrates, ½ ton per cow ..	59	17,534	2,828

Weighing hay bales during harvesting operations.

At an average cost of £30 per ton for concentrates and an average price of 4s. 6d. per lb. for butterfat, the cost of concentrates fed to the 57 cows fed the crushed oats mixture would be £855 (28½ tons @ £30 per ton), and the value of the increased butterfat would be £455 5s. 6d. (1,979 lb. @ 4s. 6d. lb.). Similarly, the cost of concentrates fed to the 59 cows receiving the linseed meal would be £885 and the value of the increased butterfat £636 6s. Obviously the cows produced most economically during the period when they received no concentrates.

ROCHESTER DISTRICT TRIALS.

The three farms selected for the trials in the Rochester district were those of Messrs. H. E. Oliver, Lockington, J. D. Pierce and Son, Nanneella, and J. H. Windle, Ballendella. In August, 1951, Messrs. J. D. Pierce and Son sold their

Cattle grazing irrigated pasture on Mr. H. E. Oliver's farm at Lockington. The enclosure was used to determine pasture growth and the amount of pasture grazed by the cows.

farm on a walk-in walk-out basis to Mr. G. F. Furtiere, who continued with the trials.

The three farms were sown down to perennial pastures and had 1 in 1 water rights and good sales quotas of irrigation water. During the three years of the trials the farmers were given nearly all the water they required, which, with rainfall, was sufficient to maintain good pasture growth throughout the growing period. The average annual rainfall at Rochester is 17·58 inches. During the year preceding the trials and for the three years in which they were carried out, the rainfall was as follows :—

1948–49, 16·84 inches ; 1949–50, 25·67 inches ; 1950–51, 23·71 inches ; 1951–52, 17·09 inches.

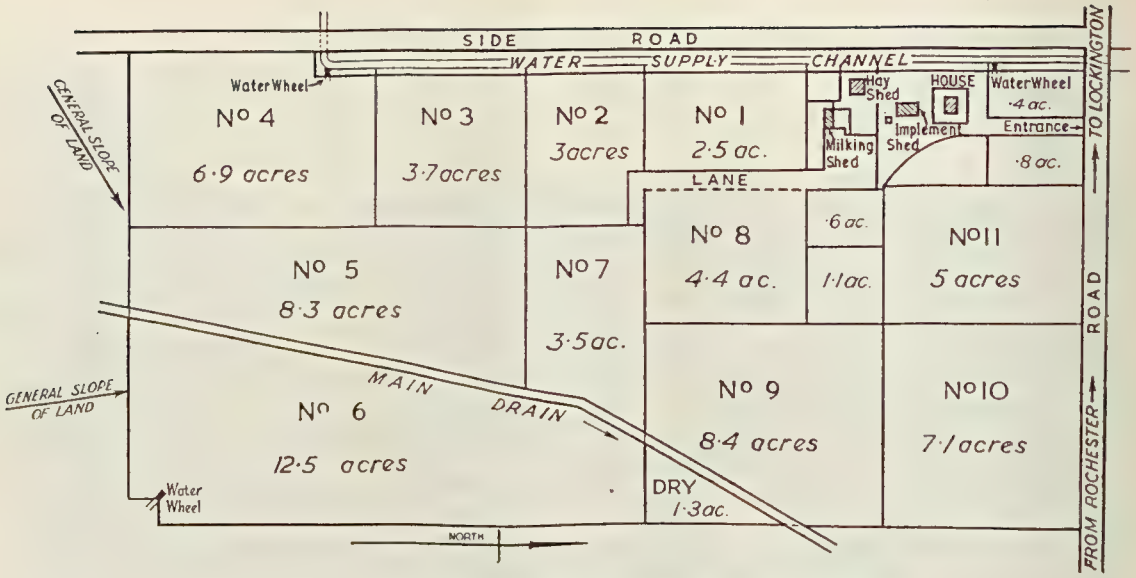
The Lockington Trial

Mr. H. E. Oliver purchased his farm in 1947 through the Soldier Settlement Commission. It was then in a very neglected condition—there were fences to repair, drains and irrigation channels to be made serviceable. One paddock, No. 9, was regraded and sown down to pasture prior to the commencement of the trials in July, 1949. The pastures in the other paddocks were revived by improved drainage, irrigation, heavy top-dressing with superphosphate and grazing.

The farm is sub-divided into 11 main paddocks of 2·5 to 12·5 acres, totalling 65·3 acres, and four small paddocks of an acre or less, totalling 3 acres. An area of about 4·4 acres is occupied by the homestead, farm buildings, and lanes. The total area is 74 acres, of which 68·3 acres are in permanent irrigated pasture. There is an unirrigated corner of 1·3 acres. The combined water-right and sales quota is for 126 acre feet of water. The layout of the property is shown in Plan 1.

Paddock No. 1 has a good mixed perennial pasture and in No. 6 the pasture is mixed, but the paddock is more or less isolated by a large drain and does not receive such regular watering as the rest of the farm. The pastures in the other paddocks are generally paspalum dominant with a good sprinkling of white and strawberry clovers.

During the three years of the feeding trials Mr. Oliver did much to improve his property. In addition to his improvements in the fields, he erected an implement shed, a hay-shed, and a cattle loading ramp and



Plan 1.—Plan and general lay-out of Mr. Oliver's farm at Lockington.

formed and gravelled the laneways. A tractor and a stationary hay press were purchased. The herd of 45 milking cows is one of the highest-producing in the Rochester district. The cows are mated to calve in July, which by some is regarded as early for the Northern irrigation areas, and about fourteen calves per year are reared. Various methods of rearing calves have been tried. In 1948–49, five were reared on whole milk, using about 90 gallons per calf. The best calves were reared that year. In 1949–50, about 35 gallons of new milk per calf were used and a gruel made from linseed meal and "Codlivine". Since that date, Mr. Oliver has separated milk for them, using 150 gallons plus 35 gallons of whole milk per calf and they have done quite well. As with the other farms in the trials, a large proportion of whole milk fed to the calves was "beastings," which would not otherwise have been used. No record was kept of the milk fed to bull calves prior to sale. If this had been recorded, the quantities shown would have been somewhat lower.

Prior to the feeding trials Mr. Oliver had been feeding concentrates heavily as a supplement to pasture and pasture hay. In the year in which no concentrates were fed, he chaffed pasture hay for feeding in the bails in the winter and early spring.

Now that the trials are concluded, this farmer does not intend feeding concentrates except in cases of emergency.

Nanneella Trial

Mr. J. D. Pierce purchased his farm at Nanneella in 1922 with a minimum of capital. By the middle 1930's, he had one of the best irrigation farms in Northern Victoria and subsequently won many dairy farm competitions and herd test prizes. In recent years he took his son into partnership and, at the end of August, 1951, the farm was sold on a walk-in walk-out basis to Mr. G. F. Furtiere.

The Pierces did their field work with three horses and milked 37 cows on this 52-acre property. They usually sent some dry cattle and young stock away on agistment in the winter. When Mr. Furtiere took over he sold the three horses, purchased a tractor, and with some improvement to the drains and laneways, had no difficulty in milking 42 cows and carrying all young stock in his first year.

The farm is well laid out with a central lane and is sub-divided into ten main paddocks, half of which are of about six acres each, and the other half of about three acres, totalling 46·4 acres. Calf, bull, and stack paddocks occupy about two acres and the remaining 3·6 acres are occupied by the homestead, buildings and lanes. The homestead occupies a large area from which an additional one acre of irrigated pasture can be obtained as a calf paddock. This area is being used for tethering a bull and running calves. The lay-out of the property is shown in Plan 3.

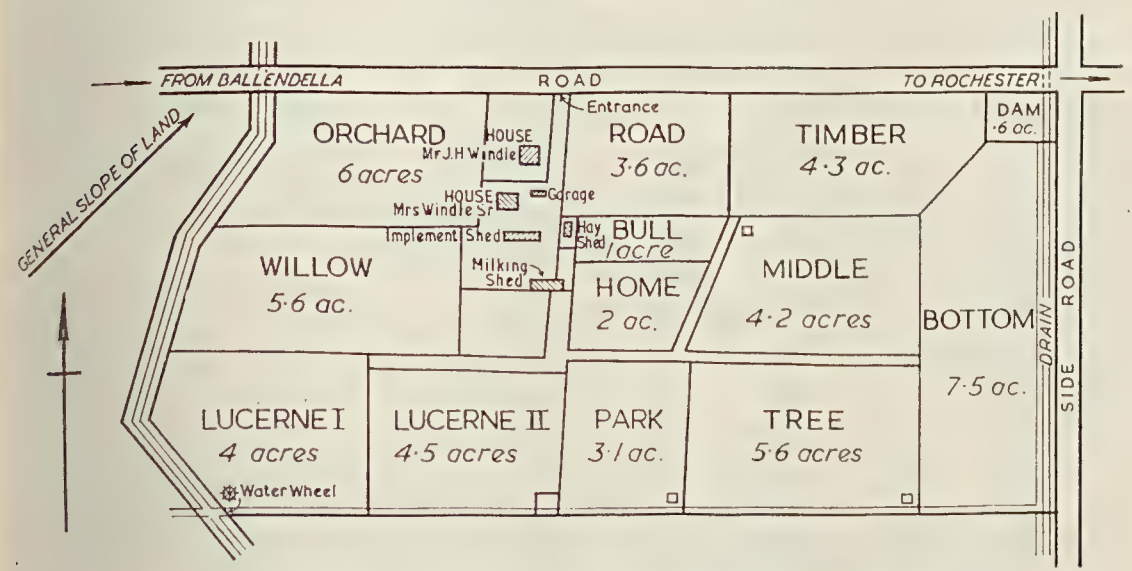
Mr. Furtiere was an ardent feeder of concentrates, but, on seeing the results of these trials, is convinced that in normal years it does not pay to feed them and is now carrying on satisfactorily, using hay as the only supplement to pasture. The water right and sales quota on this property add up to 86 acre feet. The pastures contain a variety of grasses and clovers with a preponderance of paspalum. The previous owners used the Sub. paddock of 6·5 acres for winter grazing by the milkers. Much of the subterranean clover had been replaced by white and strawberry clovers, due to faulty irrigation channels, but this paddock now carries perennial pasture brought about by irrigating it through the summer. About twelve calves are reared annually for replacements. Mr. Furtiere rears his calves on whole milk only, using about 80 gallons per calf. All calves have done well.

Ballendella Trial

Mr. J. H. Windle took over his property at Ballendella from his father about ten years ago and commenced dairy farming. Previously it had been used for grazing sheep and growing citrus (six acres). It has a total area of 56 acres with a water right and sales quota of 83 acre feet of water. The old citrus orchard with two other paddocks—the Road and the Timber paddocks totalling fourteen acres, are not irrigated, partly because of the difficulty of getting water on to them, but more because the water available can be used more effectively on the 37 acres of highly-productive perennial pastures, of which only 34 acres are used by the milking cows and most of the dry stock, the bull and calf paddocks occupying three acres and the homesteads (two), buildings and lanes about five acres. The lay-out of the farm is shown in Plan 2.

The pastures are comprised mainly of perennial rye grass and white and strawberry clovers, and, unlike the pastures on the other two properties in the Rochester district trials, contain very little paspalum.

A considerable amount of subterranean clover and couch grass grows on the unirrigated paddocks after good rains. In 1949–50 and again in 1950–51, Mr. Windle sent a number of stock out on agistment, but in 1948–49 and in 1951–52 carried all stock at home. A few bags of bran are normally fed to the herd after the cows calve and in periods of emergency. Cows are mated to calve mostly in September, and they are dried off in May and June of the following year. About eleven calves are reared each year to maintain the herd of 40 cows. The calves are reared on whole milk, about 80 gallons per calf and all have done well. As some of this milk goes to bull calves which are sold, the heifer calves would receive a few gallons less then this amount.



Plan 2.—General lay-out of Mr. J. H. Windle's property at Ballendella.

Cutting pasture from ungrazed area for weighing and sampling, after removal of the enclosure.

(see illustration, page 195)

Statistics of the Feeding Trials

On an irrigation farm a considerable proportion of the property does not grow pasture and even in the pasture paddocks the unproductive or semi-productive areas occupied by channels, drains, fences, and gateways are about 5 per cent. of the total. A summary of the use of the land on the three farms at Rochester is shown in Table 2. The gross area irrigated is 157·3 acres, and this represents 84·4 per cent. of the gross area of these three farms.

For purposes of making comparison, the figures from the three farms have been added together and treated as from one big farm.

In Table 3 much of the information collected in these feeding trials has been summarized. The figures from the three farms for the year prior to the commencement of the trials are shown. In the next column the combined figures from the three farms during the years that no concentrates were fed are shown, and the other two columns are for the years when the low protein concentrate and the high-protein concentrates were fed.

Cattle Equivalents have been arrived at by assuming that 1 cow over 2 years old equals 1 bull, or 1½ cattle from 1 to 2 years old, or 2 cattle under 1 year old, or ½ horse or 10 sheep. When converting butterfat produced to Cattle Equivalents, it is assumed that the production of 1 lb. of butterfat is equal to the carrying of 1 cow for 1 day or the production of 365 lb. of butterfat is equal to the carrying of 1 dry cow for a year. From the figures at the bottom of Table 3 it would appear that the pastures were used most efficiently during the periods when no concentrates were fed and when the high-protein supplements were fed, but the differences could not be regarded as significant.

It should be noted that the quantities of grass hay fed during the different concentrate feeding treatments were approximately the same (101, 101, and 100 tons respectively).

The quantities of superphosphate used during the year that the low-protein concentrates were fed was small, because Mr. J. H. Windle was unable to topdress his pastures that year on account of excessively wet conditions.

Particulars of the fodders used are set out in Table 4. Originally it was intended to feed crushed oats and linseed meal only, but on account of the shortage of crushed oats and their very high cost during 1951–52, bran and pollard were used in their stead.

No concentrates were fed to any stock other than the milking cows. The concentrates were fed all the year round, but greater quantities were fed per cow per day when the pastures were short in the early spring to the newly-calved cows. Hay was fed to all stock from June to September, but most of that used by the dry stock was eaten by the older cows when they were dry. No record was kept of hay eaten individually by the young stock, bulls, or horses. The variations between the proportion eaten by the milkers depended upon when feeding commenced and when it finished in relation to the times of calving and drying off.

Milk Utilization

Details of the utilization of the milk and butterfat produced show that 96·7 per cent. of the milk and 96·8 per cent. of the butterfat was sold to the factory, either as whole milk for the retail trade, as whole milk for cheese making, or as cream for butter making. 2·1 per cent. of the milk equal to 2·0 per cent. of the butterfat was used for calf rearing, the percentage of milk being higher because of the lower test of the milk at calf rearing time. 1·2 per cent. of the milk and butterfat produced

was used for domestic purposes. No attempt has been made to assess the quantity of milk spilt or lost in the utensils during milking, cooling, and separating. Milk was separated only when the skim milk was needed for calf rearing by Messrs. Oliver and Pierce.

TABLE 2.—LAND USE ON THREE IRRIGATION FARMS IN THE ROCHESTER DISTRICT.

Owner.	H. E. Oliver.	G. F. Furtiere.	J. H. Windle.	Gross.
	Acres.	Acres.	Acres.	Acres.
Irrigated pasture paddocks for milking herd and dry stock	65·3	46·4	34·0	145·7
Irrigated pasture paddocks for bulls and calves	3·0	2·0	3·0	8·0
Dry pasture paddocks	1·3	..	14·0	15·3
Area used by homes, farm buildings, yards, lanes, &c.	4·4	3·6	5·0	13·0
Total	76·0	52·0	56·0	182·0
	Acre Feet.	Acre Feet.	Acre Feet.	Acre Feet.
Water right and sales quota	126	86	83	295

TABLE 3.—THE DIFFERENT FEEDING TREATMENTS COMPARED WITH THOSE EMPLOYED ON THE FARMS THE YEAR BEFORE THE TRIALS COMMENCED.

Unit.	1948–49.	No Concentrated Supplements.	Supplements of Concentrates.	
			Of Low Protein Content.	Of High Protein Content.
Irrigation Water and Rainfall—				
Irrigation water used ac. ft.	282	285	269	306
Irrigation water applied per acre in.	21·95	22·20	21·00	23·80
Rainfall in.	16·84	22·16	22·16	22·16
Rainfall plus irrigation water in/ac.	38·79	44·36	43·16	45·96
Stock Carried—				
Milking cows No.	110	119	123	126
Bulls, young cattle, horses, and sheep in Cattle Equivalents No.	44	46	41	53
Calves reared to weaning No.	22	42	40	38
Production Figures—				
Milk produced lb.	742,627	759,998	802,145	855,325
Butterfat produced lb.	34,601	36,381	39,723	41,803
Production Information—				
Butterfat per acre of farm lb.	190	200	218	230
Butterfat per acre irrigated lb.	225	236	258	271
Butterfat per acre foot of rainfall and irrigation water lb.	70	63	71	70
Butterfat per cow lb.	315	306	323	332
Supplementary Feeding—				
Roughage (hay and chaff) tons	89	101	101	100
Concentrates lb.	20,000	nil	133,750	123,990
General Information—				
Superphosphate applied tons	27	30	23	29
Grass hay conserved tons	91	104	127	103
Theoretical Calculations—				
(*a*) Cattle which supplementary feed would maintain No.	29	28	57	55
(*b*) Butterfat produced (Cattle Equivalents) No.	95	100	109	115
(*c*) Stock carried „ „ No.	154	165	164	179
(*d*) Total Cattle Equivalents (*b* + *c*) No.	249	265	273	294
(*e*) Cattle Equivalents carried by pasture (*d*—*a*) No.	220	237	216	239

Mr. G. F. Furtiere's herd at Nanneella.

During the four years under review, 141 calves were reared. Of these, 63 were reared on new milk, receiving an average of 77 gallons of new milk per calf; 65 were reared partly on new milk and partly on skim milk, receiving an average of 21 gallons of new milk and 145 gallons of skim milk; and 13 were reared on new milk and gruels. Those 13 calves received an average of 35 gallons of new milk each, but no record was made of the quantities of gruel given them.

TABLE 4.—QUANTITIES OF DIFFERENT KINDS OF FODDER USED.

Kind of Fodder.	Quantities Used.			
	Year Before. 1948–49.	Year No Concentrates Fed.	Year of Feeding Concentrates of—	
			Low Protein Content.	High Protein Content.
	lb.	lb.	lb.	lb.
Concentrates—				
Crushed Oats	9,000	..	104,040	94,440
Linseed Meal	..	..	..	18,500
Bran	11,000	..	19,030	8,250
Pollard	..	..	10,680	2,800
Total	20,000	Nil	133,750	123,990
	tons.	tons.	tons.	tons.
Roughages—				
To Milkers—				
Pasture Hay	26	20	50	25
Pasture Chaff	..	3	..	1
Oaten Hay	..	14	..	..
Oaten Chaff	4	..	..	..
To Dry Cattle—				
Pasture Hay	59	53	51	74
Oaten Hay	..	11	..	..
Total	89	101	101	100

Samples of the fodders were taken regularly for analysis, but the final results are not yet available. The indications are that the linseed meal was considerably better than the guaranteed analysis and average composition given in standard feeding tables and that the other foods were of average composition.

(continued on page 229)

Yarra Glen Pasture Competition

Report of the Judge, S. C. POWELL, B.Agr.Sc., Agrostological Research Officer

A Lilydale district scene. On most areas south of the Dividing Range, rainfall is adequate for the maintenance of productive dairy pastures.

THE competitions conducted each year by the Yarra Glen Agricultural and Horticultural Society were designed to stimulate interest in pasture improvement, and provide an opportunity for farmers in the district to discuss and compare methods of establishing and maintaining permanent swards. Pasture improvement has made great strides in this and neighbouring districts where the rainfall is adequate and sufficiently reliable for the maintenance of high-producing perennial species, but there is still much to be done.

A few enterprising farmers are bringing into production what might be regarded as third class hill country, and the resultant pastures demonstrate the potential value of this type of country (in the good rainfall areas of the State) which, not many years ago, was regarded as being practically valueless. It is remarkable to see advances being made in this direction while large areas of rich, fertile, flat country are still neglected.

Entries in the 1952 competition were divided into three sections, namely :—

Section 1. Five acres of permanent pasture on flat country ;

Section 2. Five acres of permanent pasture on rising country ;

Section 3. Improvement of 5 acres over twelve months (October, 1952 to October, 1953).

Owing to the lateness of the season last spring, pastures generally were backward, and large areas of flat country had not recovered from the severe flooding which occurred during the winter. The plots exhibited in Sections 1 and 2, however, were well up to standard compared with previous years, and, in most cases, high scores were obtained.

In judging the pastures in these two sections, consideration was given to the general appearance and uniformity of the swards, the denseness and quality of the pasture, botanical composition, presence or absence of weeds, and management. Entries in Section 3 were inspected to determine their condition at the beginning of the twelve months' improvement period.

The pastures in Sections 1 and 2 were judged on their condition at the time of inspection and, as the actual carrying capacity of the plots entered was not taken into account, all competitors had an equal chance of scoring high points.

PERMANENT PASTURES

A "permanent" pasture is expected to remain productive for ten years or more. For this type of pasture high-producing perennial species must be selected when making up a sowing mixture. Perennial rye grass and white clover are usually the main constituents of a permanent sward on fertile flat country, and also in pastures established on rising ground where the summer soil moisture conditions are favorable for the maintenance of such perennial species.

Where the soils dry out considerably during summer, such as on the northern and western aspects of hills, and on the tops of rises, white clover may not persist, and little or no green growth during the hot months of the year can be expected. On these areas, subterranean clover will give the most satisfactory results. Subterranean clover is an annual, but because of its capacity for re-establishing itself from seed, it may be regarded as a permanent feature in a sward.

Cocksfoot

Cocksfoot is a deeper-rooted grass than perennial rye grass, and is recommended for the looser, drier, less fertile soils in the area. For maximum production, however, it requires a moist soil during the warmer months. It will grow well in association with perennial rye grass, and, accordingly, is often included in general sowing mixtures in areas where the rainfall exceeds 30 inches per annum. It makes poor winter growth, but produces abundant feed during late spring. Under favorable conditions, green growth may continue right through until the autumn. For best results, cocksfoot should be kept moderately well grazed. It is a useful grass for hay purposes, and generally provides good aftermath growth.

Phalaris Tuberosa

Phalaris tuberosa is not yet grown to any extent in the Yarra Glen district, but may possibly find a place as an alternative to perennial rye grass. It has greater drought-resisting qualities, and can also be grown in areas which are too wet for perennial rye grass. It is also adapted to a wide range of soils. This grass, however, is rather difficult to establish as it is unable to compete with vigorous species in the early stages.

For best results Phalaris should be sown alone, or with a little subterranean clover seed only. A well-prepared seed bed is essential. Once it becomes well established, it can make strong, vigorous growth.

Paspalum Dilatatum

Paspalum dilatatum is of second-rate fodder value, but occasionally is sown in wet areas. It also is fairly drought resistant. In moist areas, heavy grazing during summer is necessary to keep paspalum in check. It is useful for soak areas, but because of its persistence, it should not be sown in areas required later for cultivation.

New Zealand Short Rotation Rye Grass

Italian rye grass, or the New Zealand Short Rotation rye grass, which is a cross between Italian rye grass and perennial rye grass, may be included in the sowing mixture for early feed. The former, although a biennial, tends to thin out after the first season, but Short Rotation rye grass, provided it can withstand the competition of perennial rye grass and other species, may persist for several seasons.

The tussocks on this Dixon's Creek farm indicate faulty drainage.

Clovers

Alsike clover and red clover or cowgrass are short-lived perennial clovers which are also occasionally included in sowing mixtures in dairying districts.

Strawberry clover is a summer growing perennial which thrives in wet, low-lying areas, and is fairly

tolerant of salty or alkaline conditions. The usual method of establishing this clover in gullies and depressions is to plant roots.

Clovers build up the nitrogen level of the soil and respond well to superphosphate dressings.

Other Species

There are many other pasture species which have their usefulness in a mixed sward, and some may be chosen for special purposes —such as Phalaris arundinacea (Reed Canary grass) and Lotus Major for wet situations, Prairie grass for late winter and early spring feed, Kikuyu grass for soil binding in gullies, and so on. Pasture mixtures and seeding rates may be varied to suit requirements, but in the dairying districts, most permanent pastures consist of perennial rye grass, cocksfoot, subterranean clover and/or white clover.

Volunteer Species and Weeds

Volunteer species such as Yorkshire fog grass, rib grass (plantain), suckling clover and other annual clovers, burr medic, flatweed (often mistaken for English dandelion), silver grass, winter grass (*Poa annua*), capeweed, sorrel, docks, rushes, thistles, shivery grass and many other species of minor importance often intrude into permanent pasture swards.

A high percentage of any of these volunteer species in a permanent pasture sward is undesirable as they take up space which should be occupied by more productive species and, if neglected by stock, are likely to run to seed and become a problem in later years. Topping of weedy pastures to prevent seeding is a desirable practice, particularly in the control of fog grass, which is likely to "get away" from stock in the late spring. Rotational grazing, combined with regular top-dressing, and, where necessary, occasional liming, will keep most volunteer grasses, clovers and weeds under control. Where conditions favour the development of sown species, a dense pasture will result and inferior species will be suppressed.

The nutritive value of a pasture depends to some extent on the quality of the individual species present, but a pasture made up of about 60 per cent. grasses and the balance clovers, should provide a balanced diet for stock. The ratio of grass to clover fluctuates from year to year and even month to month. It is dependent to a large degree on the management of the pasture.

Effect of Haymaking on a Pasture

Pastures closed up for hay too frequently, particularly those closed early for the purpose of ensuring a heavy hay crop, tend to become grass-dominant. Pastures heavily grazed for long periods tend to become clover dominant, and if overgrazed are likely to be thinned out, and subsequently become weed infested. The sward should be given a chance to recover after each grazing, and if required to produce a hay crop, the paddock should not be closed too early.

From a pasture point of view, it is better to aim at a medium hay crop rather than a heavy crop which would be detrimental to the grass-clover balance. Hay should always be fed out on the paddocks from which it was cut as, in this way, most of the potash removed is returned through the animal.

Pastures should be harrowed after each grazing, or as frequently as possible to scatter the droppings. Dung pats, if not broken up and scattered, result in rank, unpalatable growth.

Most soils in the medium to high rainfall areas are deficient in phosphate, and as a rule, a bag (186-lb) to 2-cwt of superphosphate per acre may be regarded as an optimum annual dressing.

RESULTS OF THE COMPETITION

Section 1. Flat Country—5 acres Permanent Pasture (8 entries)

First place in Section 1 was awarded to Mr. W. Lawrence, of Tarrawarra, who exhibited a uniform, dense pasture of high quality, comprised mainly of perennial rye grass and white clover. The grass : clover ratio was well balanced.

Mr. J. Pape, of Dixon's Creek, (right), discussing his entry in Section 2 with Mr. D. White, Tarrawarra.

Subterranean clover was making a fair contribution, and there was a sprinkling of cocksfoot and volunteer suckling clover throughout the sward. Flatweed and fog grass and other inferior species were present, but not to any serious degree. A liberal dressing of superphosphate had been applied to this pasture each year since its establishment.

Messrs Ruddock and Co., of Coldstream gained second place with a pasture consisting mainly of perennial rye grass and subterranean clover. Although weeds were not so much in evidence, there was more fog grass on this plot, and the sward was not quite so dense as that of the winning entry. There was a fairly high percentage of suckling clover in this pasture. Because of the high fertility of the soil on this flat, superphosphate had not been applied every year. In 1950 the paddock was given a dressing of lime at the rate of 6-cwt. per acre.

Third place was awarded to Mr. R. G. Miller, of Steel's Creek, whose well-balanced sward of rye grass and clovers would probably have gained first place had it not been for some thin, weedy patches which detracted from the appearance and quality of the pasture as a whole. There was also a fair amount of suckling clover on this plot. Liming of a section of the paddock in which this plot was situated showed little or no benefit, but regular dressings of superphosphate were found to be necessary to maintain a productive sward.

Section 2. Rising Country—5 acres Permanent Pasture (12 entries)

In the rising country section, first place was awarded to Messrs. Houghton Bros., of Tarrawarra, for a 5-acre section of a large paddock. The plot exhibited was well-balanced, very uniform and dense, and the sward was comprised mainly of perennial rye grass and white clover. There was a sprinkling of subterranean clover throughout this plot. Unproductive grasses and weed

SECTION 1. FLAT COUNTRY—5 ACRES PERMANENT PASTURE.

Entrant.	Appearance and Uniformity. 20.	Denseness and Quality. 20.	Botanical Composition. 20.	Absence of Weeds. 20.	Management. 20.	Total. 100.
W. Lawrence, Tarrawarra ..	19	19	19	17	19	93
Messrs Ruddock and Co., Coldstream	19	18	17	18	18	90
R. G. Miller, Steel's Creek ..	18	17	18	17	19	89
G. H. Norris, Dixon's Creek ..	18	17	17	18	18	88
R. Selman, Lilydale	19	18	16	17	18	88
R. Michaelis, Steel's Creek ..	18	17	16	18	18	87
Houghton Bros., Tarrawarra ..	17	16	16	16	18	83
W. Hunt, Steel's Creek ..	17	16	15	14	18	80

SECTION 2. RISING COUNTRY—5 ACRES PERMANENT PASTURE.

Entrant.	Appearance and Uniformity.	Denseness and Quality.	Botanical Composition.	Absence of Weeds.	Management.	Total.
	20.	20.	20.	20.	20.	100.
Houghton Bros., Tarrawarra ..	19	19	19	19	19	95
J. Pape, Dixon's Creek ..	19	18	18	19	19	93
R. Michaelis, No. 2 entry, Healesville	18	18	18	18	19	91
R. Michaelis, Steel's Creek ..	18	17	16	18	19	88
D. White, No. 2 entry, Tarrawarra	18	17	16	18	19	88
J. Lithgow, No. 2 entry, Yarra Glen	18	17	17	16	18	86
Ruddock and Co., Coldstream	18	17	16	17	18	86
J. Lithgow, No. 1 entry, Yarra Glen	18	16	15	17	18	84
Newman and Nicholson, Yarra Glen	18	16	17	15	18	84
D. White, No. 1 entry, Tarrawarra	18	17	17	14	18	84
R. Selman, Lilydale	18	16	15	16	18	83
R. Michaelis, No. 1 entry, Healesville	16	15	15	12	18	76

species were in the minority. Regular top-dressing with superphosphate, and controlled grazing had contributed to the development of this high quality pasture.

The plot of Mr. J. Pape, of Dixon's Creek, which is situated on the crest of a rise, gained second place. This pasture of perennial rye grass and subterranean clover, had been liberally fertilized with superphosphate, was very uniform, and there was almost a complete absence of weeds.

The sward, however, was not so dense as that of the winning entry, and there was a little less clover. An annual dressing of superphosphate at the rate of at least one bag (186-lb.) per acre is desirable to maintain a productive pasture on this type of country.

Third place in this section went to Mr. R. Michaelis for his No. 2 entry at Healesville. This plot of perennial rye grass, cocksfoot and white clover was a good demonstration of what can be done in the poor hill country typical of this area. Liming and the application of heavy dressings of superphosphate had given worth-while results. (Mr. Michaelis makes a practice of applying 2 bags of superphosphate to the acre annually. The plot paddock was sown down in 1948 and has since been given two dressings of lime, each at the rate of ½ ton per acre).

Section 3. Improvement of 5 acres over 12 months (October, 1952 to October, 1953), 10 entries

Entries in Section 3, which were inspected to determine their condition at the beginning of the twelve months improvement period, ranged from plots of roughly cleared country or land prepared for sowing, to established permanent pastures which had deteriorated through lack of attention or which had not yet reached maximum productivity. Points will be allocated in October of this year for improvement relative to the degree of improvement considered possible over the twelve months' period in each case.

The entries were as follows:

J. GRASS, YARRA GLEN.—A paddock on rising ground. A reasonably good pasture had developed naturally as a result of feeding out meadow hay on the area. Rye grass and subterranean clover were the main productive species present. Mr. Grass hopes to improve this paddock by surface working to reduce weed growth as much as possible, so providing a seed bed for white clover, which, if incorporated, should greatly improve the productivity of the sward.

HOUGHTON BROS., TARRAWARRA.—This plot, in a roughly cleared paddock, was

very tussocky and, at the time of the preliminary inspection, was providing very little feed. Subterranean clover had been surface sown three years ago, and only one dressing of superphosphate had been applied. The subterranean clover had taken fairly well, but the greater part of the area was dominated by native weeds and grasses.

R. Michaelis, Healesville.—A newly-cleared area in timber country on which white clover had been sown to build up the nitrogen level of the soil prior to the establishment of a permanent sward. Half-a-ton of lime and two bags of superphosphate per acre had been applied. The white clover, although patchy, was making strong growth while the balance of the sward was comprised of native species, and tea-tree and scrub regrowth.

R. Michaelis, Steel's Creek.—This entry was in "bulldozed" hill country. The area had been rotary-hoed in spring 1951, and again during the summer. During the the autumn of 1952 the area was again rotary-hoed and limed, and a mixture of perennial rye grass, short rotation rye grass, cocksfoot and white clover, was sown. At the time of sowing, superphosphate was applied at the rate of two bags per acre. Cluster clover had come in naturally and was making dense growth at the lower end of this new field. The sown species were not very much in evidence at the time of the preliminary inspection.

Newman and Nicholson, Yarra Glen.—A section of rising ground sown to oats in 1951, followed by the establishment of grasses and clovers in the autumn of 1952. A fairly good strike of both grasses and clovers had been obtained, and if these thicken up in the meantime and suppress the weed growth, a highly productive pasture should result.

R. G. Newman, Yarra Glen.—An area which had been seeded down with rye grass, white clover, subterranean clover and cow-grass. This had been top-dressed with superphosphate at the rate of two bags to the acre. Fog grass, native bent, chickweed, sorrel and other weeds made up a fairly high percentage of this sward. The area had been closed for hay, and a reasonably good crop was expected, although it will not be of high quality because of the high percentage of inferior species.

G. H. Norris, Dixon's Creek.—Five acres of flat country which is in need of draining and clearing of rushes before a high-class permanent pasture can be established. The area was limed during 1951, and it was thought that this treatment had improved the drainage to some extent already. The paddock is to be ploughed up and resown.

D. and M. Towt, Dixon's Creek.—Portion of a cleared hillside. A few stumps remained and bracken fern was fairly thick in patches. There was very little feed on this paddock. Native grasses, which were thinly dispersed, were making little growth.

Ruddock and Co., Coldstream.—A paddock which had been cultivated in preparation for the sowing of barley. The area is to be sown down to pastures this autumn.

R. Selman, Lilydale.—Portion of a large area which is gradually being cleared of timber and sown down to pastures. The section entered in the competition had been established for some time, and although patchy and somewhat weedy, was providing valuable feed. The main species present were perennial rye grass, fog grass, subterranean clover, suckling clover and flatweed.

LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

GRINDING LUCERNE HAY

THE claim that roughages are much more efficiently digested by cattle if fed as hay or long chaff is not borne out by results obtained in digestibility trials with lucerne hay, carried out by E. W. Swanson and H. A. Herman, of the University of Missouri, United States of America. The digestibility of chopped, medium-ground, and finely-ground lucerne hay was compared in the trials. Commercial hay was prepared as follows :—

1. Chopping hay into 1½ to 3-in. lengths.
2. Preparing medium-ground hay in a hammer mill with a 1-in. screen.
3. Preparing finely-ground hay in a hammer mill with a $\frac{5}{16}$-in. screen.

The finely-ground hay had the appearance of a fine meal, but some stemmy material up to ½ inch long was present in the medium-ground hay.

The total digestibility of the hay for the three methods of preparation was 57·28, 56·09, and 56·97 per cent., respectively. The Friesian heifers used in the trial ruminated normally when fed the chopped hay, but rumination was infrequent when feeding on the medium-ground hay, and soon ceased altogether when feeding on the finely-ground hay.

There were no significant differences in the digestibility with fineness of grinding, and Swanson and Herman concluded that rumination was not essential for normal digestion of finely-ground lucerne hay.

There does not seem to be any practical application of these findings, since the cost

of grinding has not been considered, but they do indicate that much has still to be learned about digestion of foodstuffs by ruminants. Does this finely-ground meal enter the rumen for fermentation by the micro flora and fauna living there? Is this fermentation, soaking, and rumination only an expedient for the digestion of long, coarse roughage?

It is generally believed that the chemical actions taking place in the rumen have a direct bearing upon the digestion of the food and the production of proteins and accessory food factors which are of direct benefit to the animal.

Fodder Costs Compared

A farmer from the North-Eastern district stated that he can purchase lucerne meal locally at £22 10s. per 2,000 lb., bran at the same price, and lucerne hay at £12 10s. per ton. He wished to know which was the best and cheapest of these foods to obtain for his dairy cows. Lucerne hay and lucerne meal have the same food value and bran is only a little better. In this case the answer is unquestionably lucerne hay.

[A.C.T.H.]

FODDER PRICES

Prices of animal foods are variable, but at present Melbourne prices, grains and meals are comparatively better buying than oaten and lucerne hay and chaff. In mid-April, bran and pollard were quoted in Melbourne at 4s. 4d. per bushel ex store in small quantities and 4s. 3d. in ton lots, wheat at 15s. 6d., and 15s. 3d. in 2-ton lots, oats at 7s. 6d. and 7s. 3d., malt combings at 10s. per bag (approximately 56 lb.), oat hulls at 5s. 6d. per bag (approximately 56 lb.), and meat meal at £29 10s. per 2,000 lb. All these foods were readily available. Barley and linseed meal were practically unprocurable and, while supplies of maize were good, the price, 23s. per bushel, was high.

The demand for hay and chaff was said to be very quiet, but no doubt the prices on rails, Melbourne, were too high and buyers were seeking their requirements locally at reasonable prices. Best mill-cut oaten chaff was quoted at £21 to £22 per ton on rails, Melbourne, and cow chaff down to £18, good meadow hay at £12 per ton, lucerne hay at £25, and lucerne chaff at £45.

The accompanying table has been prepared to give readers some appreciation of the relative monetary values of fodders. The comparative values are based on the food values (starch equivalents) of the fodders at 3·65d. per lb. of starch equivalent, and have not taken into account

Fodder.	Food Values.		Monetary Values.		
	Starch Equivalent. per 100 lb.	Protein Equivalent. per 100 lb.	Prices Quoted Melbourne, April, 1953.	Cost per Food Unit (Starch Equivalent).	Comparative Values Based on Starch Equivalent at 3·65d. per lb.
	lb.	lb.	£ s. d. Per bushel.	d.	£ s. d. Per bushel.
Pollard	69	10·6	0 4 3	3·65	0 4 3
Bran	44	9·9	4 3	5·79	0 2 8
Wheat	72	8·0	0 15 3	4·23	0 13 2
Barley	71	6·8	Not quoted	..	0 10 10
Oats	62	7·6	0 7 3	3·67	0 7 6
Maize	77	7·4	1 3 0	6·40	0 13 2
			Per bag (56 lb. app.)		Per bag.
Malt Combings	45	16·0	0 10 0	4·76	0 7 8
Oat Hulls	21	0·4	0 5 9	5·87	0 3 7
			Per ton.		Per ton.
Oaten Chaff	42	3·5	22 0 0	5·62	14 7 6
Meadow Hay	38	5·8	12 0 0	3·38	13 0 0
Lucerne Hay	35	8·3	25 0 0	7·85	12 0 0
Lucerne Chaff			45 0 0	14·13	

special properties as protein content, palatability, and convenience for feeding. If grain has to be crushed, pollard would be a much better buy at 4s. 3d. than oats at 7s. 6d., both of which, with meadow hay, are the cheapest foods offering.

If the bags of malt combings and oat hulls contained more than 56 lb., then their prices would compare more favorably with pollard and oats. Bushel weights vary. A bushel of pollard or bran weighs 20 lb., wheat 60 lb., barley 50 lb., oats 40 lb., and maize 56 lb.

[A.C.T.H.]

SEASONAL ADVICE

Feeding

Home-grown conserved fodders should be fed from now on in accordance with quantities available and the requirements of the herd. Production is often lowered because farmers commence feeding their hay too late in the winter.

Dehorning

Dehorning should be carried out before the very cold weather sets in. Cows in a dehorned herd average about 20 lb. of butterfat per head more per year than cows in a horned herd.

WHALE SOLUBLES

Whale solubles is a dark, viscous liquid, not unlike molasses to look at. It has a smell like glue and dries out like "size" during hot, dry weather. A by-product of the whaling industry, it has a crude protein content of 45 per cent. It has been used in feeding trials with pigs at Dookie and Longerenong Agricultural Colleges, both as a replacement and as a partial replacement of meat meal. It is more costly than meat meal and is not as convenient to feed. At both centres it was found that half the meat meal could be replaced with whale solubles, but its value in wholly replacing the meat meal appears to be limited to well-grown pigs over 50 lb. live weight. It proved to be an inadequate protein supplement in the rations of weaners of 30 lb. live weight and under.

[A.C.T.H.]

FEEDING OATS TO POULTRY

It is cheaper to feed oats than wheat at present, and poultry farmers would be advised to include a substantial quantity in the rations.

Apart from the financial aspect, oats add variety to the ration. The husks reduce the food value of oats by approximately 20 per cent., but some American authorities claim that they contain a substance which has a curative effect on feather picking.

When feeding oats for the first time, only a small quantity should be included in the ration, as poultry prefer wheat to oats, and considerable wastage will occur if large quantities are offered from the beginning. When the birds commence to take to the oats, the quantity may be increased almost daily until the intended proportion is being fed.

Feeding trials conducted at the State Research Farm, Werribee, during 1947–48, tested, among other things, the comparative feeding value of wheat and oats as a grain ration for poultry. Where the comparisons were made between wheat and oats, wheat or oats was available to the birds all the time in hoppers instead of being fed in the afternoons in the litter. In the mornings, the birds in each pen received the same quantity of wet mash and, during the day, greenstuff. Shell grit was available all the time.

The trials were conducted with 100 Australorp and 100 White Leghorn pullets, each divided into two pens of 50 birds each. One pen of each breed was fed oats and the other wheat. The results, setting out the average total dry weight of food consumed and average number of eggs laid per bird in each of the pens were as follows :—

Breed.	Grain Fed.	Food Consumed.	Eggs Laid.
		lb.	No.
Australorps	Wheat ..	96·1	208·7
	Oats ..	96·1	184·8
White Leghorns	Wheat ..	96·4	185·4
	Oats ..	95·9	178·4

The tests showed that oats may entirely replace wheat as the grain ration for laying fowls. The lower egg production in the pens where oats were fed was probably due to the husk on the oat grain which reduced their food value a little, and the birds did not eat more grain to compensate for the lower food value.

A good-quality oat was fed throughout the tests. This is an important factor in the feeding of oats to poultry.

[M. D. Hall, Poultry Expert.]

PIG CARCASS COMPETITION

Pigs are grown primarily for their meat and, consequently, should be valued for the quantity and quality of meat they produce. When judging pigs, it is desirable to consider what is beneath their skin. How much fat, muscle, and bone are there? That is the way consumers judge pigs.

If pig raisers could see the meat qualities of their pigs, they would be more competent in their selection of breeding stock, and in deciding when pigs are in best condition for selling for pork or bacon.

An opportunity for farmers to see the meat qualities of particular pigs is provided by the Australian Meat Board's Bacon Pig Carcass Competition. The competition will terminate in a field day, to which the public is invited, at the Gippsland Co-operative Bacon Company's factory at Dandenong on Friday, 29th May, commencing at 1 p.m. In the past, this annual event has attracted approximately 100 entries; some 200 farmers have attended each of the field days.

This year, most of the old competitors and several new ones have entered pigs representing most of the breeds and crosses in use in Australia.

The cut carcasses from the competition pigs will be exhibited at the field day. With each carcass will be a score card showing where it falls short of the ideal standard. Such a display, together with short addresses, should provide an interesting and informative programme for all people interested in the pig industry.

[L. A. Downey, H.D.A., Pig Expert.]

HONEY BEES AND POLLINATION OF FRUIT AND SEED CROPS

The practice of using honey bees for pollination of orchards, certain vegetable crops, and most seed crops is a profitable one. Beekeepers are inclined to be over-cautious about entering the pollination field; this is probably a result of prejudice rather than because of any adverse effects from the lease of bees for pollination.

Bees located in an orchard are most effective with early-flowering fruits which reach their peak of blossoming early in spring when weather conditions are liable to be unsettled.

Bees will not fly far from their own hives in showery weather. If the colonies are scattered around an orchard, the chances of obtaining a good set of fruit by good pollination will be greatly improved.

Native bee populations in most districts are inadequate for maximum pollination of crops. Factors contributing to the lack of native pollinators include:—

(1) *Cultivation* which breaks up the nests of the ground-living bees and kills both adults and young.

(2) *Insecticidal Sprays.*—Large quantities of sprays are used over considerable areas each year through spring and summer, the main seasons when these insects are active, and their death rate must be high.

(3) *Native Flora.*—As areas are brought under cultivation, the native flora is replaced by introduced flora, which is not always suitable for the native insects.

Quite apart from the inadequacy of numbers, native bees are not always effective pollinators, especially because of their small size. Many of our fruits and vegetables developed in the Northern Hemisphere in association with the honey bee, and they are adapted to pollination by bees of this size and of similar habits.

In a test conducted by the Department of Agriculture, the fruit set on pumpkin vines in the metropolitan area was increased from 50 to 95 per cent., by the use of bees and on mustard seed in the Western District, yields were increased from "no yield" to "five bags per acre". This yield could have been higher, as much seed was lost when the harvester went through the over-ripe crop.

American experiments have shown the value of bees for production of lucerne, clover, and other seed crops.

The practice of leasing bees for pollination is not general, as beekeepers are reluctant to enter this new field of activity. One or two minor cases of losses from spraying have been reported but, in each case, the beekeeper seems to have been

as much at fault as the orchardist, as there had been no written agreement concerning the terms of lease and notification of spraying times.

One beekeeper has been successfully leasing bees for two or three years, and has had no occasion for complaint. In all cases, the orchardists have been amply rewarded for their enterprise. Many American beekeepers undertake pollination on a large scale and are finding the project profitable. Agreements for beekeepers to receive a percentage of the increased production occasioned by the bees are common, and all details of lease, spraying, and general management of crops and bees are set out in writing. Losses of bees are thus avoided.

Victorian producers and apiarists would be well advised to look into the possibility of expanding the pollination service.

Beekeepers who intend to make bees available for lease in the coming spring should see that all hives have adequate winter stores and, if necessary, should apply stimulative feeding in late winter to have the colonies at peak population in early spring when needed for pollination. A weak colony is useless for pollination and also is a liability, and might even die out before the flowering is finished. In most countries, the minimum strength of hives leased is specified. For any grower or beekeeper who is interested in this matter, the Superintendent of Live Stock, Department of Agriculture, Treasury Gardens, Melbourne, C.2, has information available on pollination and lease agreements.

[D. R. LANGRIDGE, B.Agr.Sc., Live Stock Research Officer.]

CERTIFIED PULLORUM-TESTED POULTRY FLOCKS

A certified Pullorum-tested Flock is one in which all stock over six months of age have given a negative reaction to the agglutination test for Pullorum Disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector, but it is not necessarily a guarantee of the type of birds in the flock.

The under-mentioned flocks have been certified by the Department of Agriculture, and will remain so for the current calendar year, or until such time as the Chief Veterinary Inspector determines.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Particulars of breeds of birds tested are as shown hereunder:—

A. Australorp; B. White Leghorn; C. Rhode Island Red; D. Sussex; E. Langshan; F. Brown Leghorn; G. Buff Orpington; H. Black Leghorn; I. Minorca; K. Legbar; L. Turkeys; M. New Hampshire; N. Plymouth Rock; O. Indian Game; P. Ancona.

Owner.	Breed.	Number of Birds.
Bayfield Poultry Farm (J. E. Robinson), Bayfield-road, Bayswater	A	752
Corbett Bros., Torbay-street, Macleod	A	2,647
Davies, L. F., Ireland-road Spring Vale	B. C	2,581
Gibbs, J., Eltham-road, Lower Plenty	A, B	914
Kennedy, F., cr. Watson and Fern Tree Gully-roads, Glen Waverley	C	759
McCabe, R., Gladstone-road Dandenong	A, B	1,626
McQueen, R. J., Spring-road, Highett	C	517
Maytime Poultry Farm, (R. J. O'Brien) Watson's-road, Glen Waverley	C, D	525
Myer Emporium ("Norman Lodge," Mt. Eliza)	A, B	2,320
Neale, S., Edward-street, Boronia ..	A, B	1,038
Nemet, P., Spring Vale-road, Spring Vale	A, B, C	3,456
Salmond, J. B., Deer Park ..	H	110
Scales, J., West Wattle Tree-road, Boronia	A	2,263
Ridge and Son, Myrtle-grove, Blackburn	B, C, D	3,527
Schulze, L. H., Torquay-road, Grovedale	A, B	1,749
Simpson, G. D., "Greenways," May-road, Glen Waverley	A, B	3,562
Stephens, R., Reservoir-road, Kennington	A	1,835
Stewart, H. D., Marshall-street, Maryborough	C, K	417
Swift, D. A., Kangaroo Flat ..	A, B	2,045
Thomson, G., "Fortuna," Westall-road, Spring Vale	A, B	1,186
Waiting, T., Scoresby-road, Boronia	A, B	1,735

THE DAIRY FARM

Gestation Periods of Dairy Cows

WHEN groups of yearling heifers are served by two different bulls, and the groups subsequently run together, how long should the period between services be in order that the male parentage of the calves can be determined with certainty ? That is a problem which concerns every dairyfarmer, and, in particular, every breeder of pedigreed dairy cattle.

The average gestation period (the interval between conception and calving) for dairy cows is about 283 days, most cows calving between 280 and 285 days. However, numerous cases have been reported in which calves were carried more than 300 days, while, at the other extreme, it has been claimed that calves carried only 250 days have been reared successfully. Such cases are rare, however, and there is always the possibility that a service was missed or that a dam exhibited false heat. Nevertheless, reliable records indicate that normal live calves may be born after gestation periods ranging from 268 to 297 days, giving a range of 30 days.

Though the reasons for this variation are not all known, several factors apparently play a part :—

1. Bull calves, on the average, are carried about one day longer than heifer calves.

2. Twin calves are usually carried for a period of about six days shorter than the period taken by single calves.

3. First calvers frequently have gestations about two days shorter than dams which have already calved once.

4. There are some differences between breeds.

5. The season of the year at which conception takes place can affect the gestation period in some cases.

Thus, it is known that there may be a gestation range of about 30 days, but we cannot determine accurately what causes the variations from the average of 283 days. Since cows normally come on heat at 21-day intervals, and two different bulls may be mated to a cow in the 30-day period, a gestation chart is not an unfailing guide to the paternity of the offspring. Where two bulls are run in succession with a group of heifers in the same mating season, and where no individual breeding records are kept, the paternity of some of the offspring may be in doubt.

For example, if a group of heifers was mated successfully on October 31, 1952, they would be due to calve on August 10, 1953. However, it would be possible for calving to be spread over a 30-day period, i.e., one to calve on July 26 and one as late as August 24. If another group of heifers was mated successfully to a different bull on November 28, 1952 (i.e., 28 days after the first group), calving dates would be centred around September 5, 1953, but one or two could calve normally as early as August 21.

If the two groups of heifers had been run together after mating, the paternity of calves born between August 21 and August 24 would be uncertain. They could have been the offspring of the first bull carried 294 to 297 days or of the second bull carried only 268 to 271 days. Such ambiguity, leading to mistaken parentage, could have serious consequences in a breeding programme.

Therefore, if heifers are group-mated and no individual breeding records are kept, only one bull should be used. If this is impracticable, and two bulls are used, then a period of 30 days should separate the removal of the first bull and the joining of the second. This is rather drastic where seasonal dairying is practised, but if breeders wish to register the progeny of their heifers then they must be sure that the pedigrees they submit are correct.

[T. N. Edey.]

Length of Lactation in Dairy Cows and Level of Production

One of the greatest causes of low production in Victorian dairy cattle is the low and uneven level of feeding which applies on many farms. This is reflected in the average length of lactation of tested cows which is approximately 230 days. This means that many cows are milked for periods much shorter than this.

Evidence that level of production is correlated to length of lactation can be seen through a comparison between irrigation areas and dry farming areas in a dry season. Cows on irrigation produce for a longer period each year, and usually at a higher level, because they are fed at a relatively constant level for a longer season. In the dry farming areas spring production will probably equal that under irrigation but, because of poor natural summer conditions and lack of supplementary feeding, the lactation is much shorter.

To understand just how the supply of feed over the year can affect the production of a cow, it is necessary to look at the three main ways in which a cow uses its feed :—

(1) A relatively stable quantity is used to maintain body weight and supply energy for essential body functions. This " maintenance requirement " of a cow usually includes the food required for energy used in grazing.

(2) That portion of the feed intake utilized for the growth and development of the unborn calf. This portion is very small even just before calving, and it is almost impossible to affect the size of the new-born calf by the feeding level before calving. However, during the last few weeks before calving, when the cow is dry, it is essential to feed at a reasonable level in order that the cow may build up reserves upon which it can draw during the first weeks after calving when the flush of production makes heavy demands upon the cow's system.

(3) Feed required for milk production. This portion of the total feed requirements of the animal will vary widely. In a typical lactation the production of the cow increases to a maximum soon after calving, then diminishes gradually. The rate of this falling-off in production will vary with the genetic make-up of the cow and the feed available. The amount of feed required to meet production requirements under ideal conditions vary in a similar manner—that is, highest soon after calving and gradually diminishing—and no amount of feed will arrest this natural falling off in production.

Unfortunately, under our conditions, pasture production does not follow this " production curve ". Normally there is surplus grass in spring and a shortage during winter and summer. These periods of feed shortage cause a rapid falling off in production, especially in a dry summer following spring calving. High production is usually achieved only in herds which are adequately fed in this summer period so that the natural tendency for production to decline as the lactation advances is kept to a minimum.

There are three main methods of bringing the feed supply into line with the animal's requirements at times when pastures are dormant.

(*a*) Conservation of Surplus Spring Grass.

Through the practice of good pasture management, mostly allied with strip-grazing, many farmers in the past season found themselves with a greater surplus of spring grass than ever before. Where this was conserved as silage and hay, these farmers were in a better position to meet feed requirements during the winter and late summer shortages. Reserving their hay for winter feeding of dry cows, some farmers have fed silage liberally in the dry summer and have maintained production without having to buy expensive concentrates.

(*b*) Supplementary Cropping.

Supplementary cropping is not so popular because of the work and expense involved, including the expense of having quite a proportion of the farm out of production for some time. However, in some districts, it is the established practice to try to overcome seasonal shortages by cropping. Crops, such as lucerne, millet, maize, and rape will provide a bulk of feed over the summer dry spell. Chou moellier is suitable for late summer and will carry on growing into winter without deteriorating in quality. Oats can be sown if a winter crop is needed.

Experience over the last few years has shown that maximum utilization of these crops with minimum labour can be obtained by using an electric fence to strip-graze a daily ration. This method gives a closer grazing and lessens spoilage by trampling on the uneaten part of the crop.

(*c*) Irrigation.

In those parts of Victoria served by State irrigation schemes, pastures can be kept growing through the summer. In the dry farming areas some farmers have seen the value of limited irrigation schemes and pump water from creeks and dams to irrigate a few acres by flooding or a spray system. This has proved an immense benefit in tiding them over the summer dry spell by allowing the cows a ration of green grass each day.

In addition to the above methods of overcoming seasonal shortages which have been dealt with from the point of view of spring calving areas, there is the practice of autumn calving which is a method of partially overcoming seasonal shortages in feed supply. This is practised in certain parts of Victoria where the winter is sufficiently mild, and the aim is to get as much production as possible before the grass dries off in summer. However, in these districts, feed shortages still exist in winter and late summer, and the practices enumerated above still apply for the levelling-out of the plane of feeding.

Breeding.

While a low or uneven level of feeding is the main cause of short lactations which, in turn, are associated with low production, feeding is not the only factor involved. There are many animals which dry off despite a satisfactory level of nutrition.

Such animals are undesirable and should be rejected where selection is possible. This can be done by culling them from the herd when they occur, and by selecting herd sires from animals which show persistency of lactation. Persistency in itself has no particular merits, except insofar as it is associated with high production and where high-producing animals are selected, it is usually found that the quality of persistency is already present.

[Ivo A. Dean.]

The Young Farmer

Much has been said about the desirability of fast milking, and of training the cows—or even breeding them—to fit in with this technique. From the viewpoint of securing maximum production and safeguarding the wellbeing of valuable cows any care taken in this regard is amply justified.

But fast milking of individual cows is not the only way to secure economy of labour in the milking shed. In fact, the time which can be saved by good milking technique and prompt removal of the cups when a cow is finished is small, in some sheds, compared with the time which could be saved by attention to other matters.

Consider your own routine and see whether you are taking more time than is necessary over some operations.

Would faster milking reduce your overall time, or are you already just able to keep up with the number of machine units you use ?

If those units do not occupy you fully, would it be economy to have some of them "doubled up", or would it be better to fit accurate milk flow indicators to those you have, so that you would not leave them on cows longer than needed ?

Then there is the question of handling the herd. Is your farm layout such that the cows can come from the paddock at milking time and return after being milked without having to be escorted through sundry gates ? Do the cows come readily into the bails when needed, or are they usually at the far end of a big yard ? Would dehorning of the whole herd allow of the use of a smaller yard ? Are the bail exits such that the cows will leave the bails without delay when milked ?

Are udder washing arrangements as convenient as they might be, or must you be constantly going from one bail to another to get the bucket containing the water for this purpose ?

Are washing up and cleaning arrangements convenient, or can they be better designed ? And have you a quick and easy method of loading milk or cream cans ?

Above all, is your routine such that you always go straight to each objective, or does it include much aimless activity which arises from lack of thought ?

Ponder the above questions in relation to your own shed routine, or discuss them with others and compare methods. And, of course, consider also the many other questions which will occur to you. The results may be very illuminating.

[K. M. Sillcock.]

SUBTERRANEAN CLOVER

Symptoms of Nutritional Disorders

By C. R. MILLIKAN, M.Agr.Sc., D.Sc., Senior Plant Pathologist and Deputy Biologist

To facilitate the recognition of similar disorders in the field, the symptoms of various nutritional disorders in subterranean clover (*Trifolium subterraneum L.*) have been produced in an extensive series of water culture experiments at the Plant Research Laboratory, Burnley. It is the purpose of this paper to describe the symptoms of these disorders only. A detailed account of the more technical aspects of the work will be published separately as a technical bulletin.

Manganese Deficiency

THE general growth of the plants became dwarfed, although the size of individual leaves was unaffected. The youngest leaves soon developed a yellowing which commenced in the tissues between the veins, the veins themselves remaining green after the rest of the leaf was yellow (Plate 1, Figs. A and B). Later, numerous brown dead spots occurred on these affected young leaves (Plate 1, Fig. C). A brown discoloration also occurred on the upper side of the stalks of the leaves showing the dead spots. These affected leaves, which appeared to be somewhat brittle, finally commenced dying from the margins, the dead tissue being greyish in color.

Fig. 1.—Subterranean clover grown in zinc deficient (left) and complete (right) nutrient solutions.

These symptoms were found to be similar in tests with the varieties Dwalganup, Mt. Barker, Bacchus Marsh, and Casterton. However, there was a marked difference in the effect of the same level of manganese deficiency on the growth of these varieties. Also, manganese deficiency reduced root growth more than top growth. These effects will be described in detail in the technical bulletin.

Zinc Deficiency

The first leaves formed by plants grown in zinc-deficient solutions were normal, both as regards the size of the leaflets and the length of the leaf stalks (Plate 1, Fig. F). However, light-brown dead spots appeared later on these leaves (Fig. 2; Plate 1, Fig. F). These dead spots coalesced and the dead tissue gradually extended inwards from the margins of the leaflets. Death of the leaf stalks soon followed, with the result that all normal-sized leaves died. Zinc-deficient plants of the Bacchus Marsh variety sometimes showed a reddish mottling of the first formed leaves. In the case of the Dwalganup variety, this reddish color also occurred, but was restricted to the basal half of each leaflet (Plate 1, Fig. D).

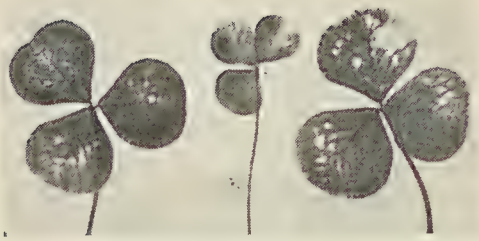


Fig. 2.—Oldest leaves from zinc-deficient subterranean clover showing the necrotic spots which are first visible on the upper surface.

Meanwhile, the later formed leaves became slightly yellow and showed a typical "little leaf" condition. The size of the leaflets and the length of the leaf stalks were very reduced, giving the plant a "rosetted" appearance (Fig. 3; Plate 1, Figs. E, F). The reduction in leaf size may be greater in the Dwalganup variety than in the Mt. Barker variety (Fig. 5). However, the general effect of zinc deficiency on growth was more severe on Mt. Barker and Bacchus Marsh varieties than on the Dwalganup variety (Fig. 5; Plate 1, Fig. E). For example, the Dwalganup variety growing in a zinc-deficient solution was found to produce short runner stems and set an odd seed per plant, whereas Mt. Barker plants growing in the same pots did not produce any seed (Fig. 5). In another experiment it was found that the late variety Bacchus Marsh developed zinc-deficiency symptoms more rapidly and severely than did Dwalganup plants (Plate 1, Fig. E).

The "little" leaves were usually narrower in proportion to their length than normal leaves. Those of the Dwalganup variety in particular were often deeply lobed at the apex (Fig. 3). Whereas the leaflets of normal subterranean clover plants are uniform in thickness, the "little" leaves from zinc-deficient plants may be very variable in thickness (Fig. 4). Zinc deficiency reduced top growth to a greater degree than root growth of subterranean clover.

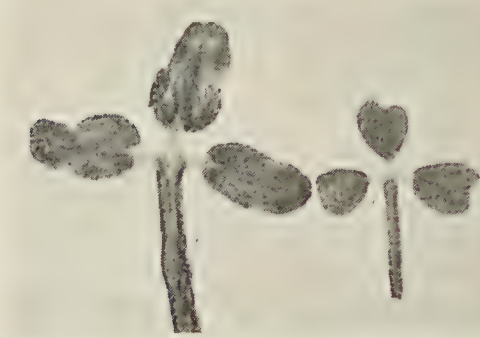


Fig. 3.—Enlarged view of extremely dwarfed zinc-deficient "little" leaves of the Dwalganup variety, showing their abnormal shapes.

Copper Deficiency

The first effect produced by copper deficiency is that growth is retarded, and the plants show a slight general yellowing. They soon developed a habit of growth which was more erect than normal (Fig. 6). The copper-deficient clover plants showed this erect growth before any dying of the leaves occurred. Leaf size was also unaffected. However, the edges of the younger leaflets soon commenced to roll upwards and inwards. Death of the inrolled margins followed, the color varying from white or light-brown to bluish-green (Plate 1, Figs. G and H).

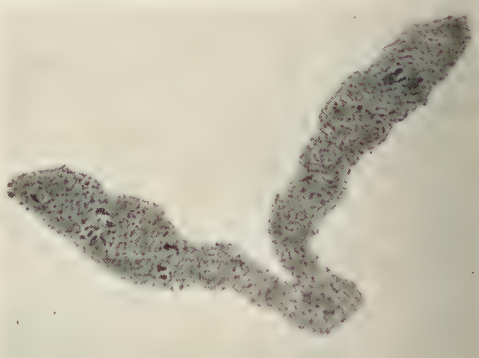


Fig. 4.—Section through a "little leaf" similar to those shown in Fig. 3. Note the marked variation in thickness across the width of the leaf, and the folding to form a deep crease at the mid-rib.

Very acute copper deficiency resulted in the death of the inrolled leaf followed by that of the leaf stalk. General growth was very reduced and no flowering occurred.

Where the deficiency of copper is less acute the plants may flower, but seed setting will be seriously reduced.

Calcium Deficiency

Leaf size was normal at first, but later both top and root growth of the calcium-deficient plants became very dwarfed. With acute deficiency the emerging leaves remained

Plate I.—A. Early leaf symptoms of manganese deficiency—interveinal yellowing with green veins; B. Manganese deficiency (var. Mt. Barker)—note yellowing of younger leaves; C. Dead spots on young leaves due to manganese deficiency (var. Mt. Barker); D. Oldest leaves from normal (left) and zinc deficient (right) Dwalganup plants. Note that zinc deficiency has produced a coloration around the mid-rib at the base of each leaflet; E. The Bacchus Marsh variety (two plants at right) is more severely affected by zinc deficiency than Dwalganup (two plants at left). The two varieties were grown together in the same water culture; F. Zinc deficiency. First leaves are normal in size, but subsequently formed leaves are very dwarfed; G. Death of the margins and cupping of younger leaves due to copper deficiency; H. Copper deficiency (var. Dwalganup) showing death of margins and cupping of leaves.

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Plate 2.—A. Potassium deficiency (var. Dwalganup). Note the commencement of the death of the margin of the oldest leaf, deep lobing of middle leaf, and extreme reduction in size of youngest leaves ; B. First symptoms of potassium deficiency on margins of the oldest leaves of the Tallarook variety ; C. Symptoms of potassium deficiency in the variety Bacchus Marsh ; D. Symptoms of potassium deficiency in the variety Mt. Barker ; E. Calcium deficiency (var. Mt. Barker). Collapse of stalks of youngest leaves ; F. Calcium deficiency (var. Mt. Barker). Death of youngest leaves from tips without any collapse of leaf stalks ; G. Calcium deficiency (var. Mt. Barker) showing death of the margins starting near the tips of the leaflets and followed by cupping ; H. Calcium deficiency (var. Dwalganup)—Collapse of the stalks of the older leaves is often accompanied by a marked reddening of the leaves. The undersides of the leaves show coloration first.

Plate 3.—A. Nitrogen deficiency (var. Mt. Barker). In the initial stages a reddening of the older leaves (starting on the under surface) and the leaf stalks, occurs ; B. A later stage of nitrogen deficiency than A. Note death of the oldest leaves and the absence of pink color in the remaining leaf stalks (var. Tallarook) ; C. Older leaf from nitrogen deficient plant, showing death of the interveinal tissues on the upper surface ; D. Left : Combined nitrogen and phosphorus deficiencies (var. Dwalganup). This treatment has induced a marked pink coloration in the stems and leaf stalks, but has reduced the dying of the oldest leaves which is a feature of the simple nitrogen deficient plants. Right : nitrogen deficiency ; E. Phosphorus deficient plants (left) are darker green in color than normal plants (right) ; F. Phosphorus deficiency (var. Tallarook). The plant is darker green than normal and the oldest leaves in turn become yellow and die ; G. Phosphorus deficiency induces a purple coloration in the stems of the Dwalganup variety ; H. Iron deficiency (var. Mt. Barker). Yellowing of the youngest leaves and reddening of the edges of the oldest leaves.

Plate 4.—A. Magnesium deficiency—Leaf reddening first occurs in the oldest leaf and later involves successively younger leaves ; B. Leaves from magnesium deficient subterranean clover plants of the varieties Dwalganup (left), Mt. Barker (centre) and Tallarook (right). The reddening is more diffuse in the leaves of the Mt. Barker variety ; C. Circular yellow spots surrounded by red tissue which occurred in some magnesium deficient leaves. Similar spots also developed occasionally in leaves from plants high in manganese ; D. Marginal coloration in the oldest leaves of plants grown under conditions of magnesium deficiency (left) and combined magnesium and calcium deficiencies (right) ; E. Effect of iron deficiency in masking magnesium deficiency symptoms. The treatments were—left : magnesium deficiency. Right : Combined magnesium and iron deficiencies ; F. Effect of nitrogen deficiency in masking magnesium deficiency symptoms. The two plants were grown together in a solution deficient in both nitrogen and magnesium. The plant on the left received nitrogen from rhizobial nodules and showed magnesium deficiency symptoms. The non-nodulated plant on the right showed nitrogen deficiency symptoms only ; G. Marginal reddening of oldest leaves of the plant caused by excess manganese ; H. Left—superphosphate only. Right—superphosphate plus ammonium molybdate 4 oz. per acre. The molybdenum-deficient plants were dwarfed and pale in color.

small and failed to unfold, and the leaf stalks did not lengthen. Collapse of the youngest immature leaves occurred. The dead tissue was a dull bluish-green color, and the leaf tip was affected before the leaf stalk (Fig. 7; Plate 2, Fig. F).

Later, the leaf stalks of the youngest *fully developed* leaves suddenly collapsed, allowing the leaves to hang down (Fig. 8; Plate 2, Fig. E).

The dead portion of the leaf stalk was whitish in color. When the leaf stalk collapse first occurred the associated leaf was unwilted, but it soon withered and died. The base of the affected leaf stalk remained green for some time after the upper portion and the leaf were dead.

Fig. 5.—Relative effects of zinc deficiency in Dwalganup and Mt. Barker varieties of subterranean clover grown in the same culture. An extreme "little leaf" condition occurred in Dwalganup, but this variety produced seed (indicated by arrows) and made better growth than Mt. Barker.

The stalks and undersides of the oldest leaves of Dwalganup plants developed a reddish color, which later appeared also on the upper surfaces of the same leaves and was accompanied by the collapse of the leaf stalks (Plate 2, Fig. H). This symptom was usually much less evident in Mt. Barker and Tallarook plants. In the latter two varieties a characteristic symptom of calcium deficiency was the death of the outer (distal) margins of the leaflets followed by a cupping and puckering of the leaflet. The color of the dead tissue was light pinkish-brown (Plate 2, Fig. G). With calcium deficiency there was also a tendency for the terminal leaflet to be folded back over the other two leaflets.

Under conditions of mild calcium deficiency, subterranean clover plants made reduced top and root growth, leaf size was smaller than normal, but the general color of the plants was unaffected and no collapse of the leaf stalks occurred.

Potassium Deficiency

Under identical conditions of potassium deficiency, it was found that plants of the Dwalganup variety were more seriously affected than those of Mt. Barker (Fig. 9).

Potassium deficiency caused a reduction in rate of growth and leaf size. Where the deficiency was acute the reduction in leaf size of the Dwalganup plants was particularly severe. Some leaf stalks with

Fig. 6.—Copper deficient subterranean clover (right) assumes an erect habit of growth when compared with that of normal plants (left).

Fig. 7.—Calcium deficiency symptoms in subterranean clover. The stalks of the younger leaves suddenly collapse.

virtually no leaf were produced (Plate 2, Fig. A), while other dwarfed Dwalganup leaflets were deeply notched at the apex (Fig. 10, Plate 2, Fig. A). These latter symptoms did not occur at any stage in potassium deficient plants of the Mt. Barker or Tallarook varieties grown in the same pots as the Dwalganup plants.

Later, dead spots appeared on the oldest leaves of the plants. The first symptoms appeared as small reddish brown coloured spots which characteristically occurred on the upper surface on or near the edges of the leaflets in the positions shown in Fig. 11 and Plate 2, Figs B and C. These dead spots soon enlarged until the entire outer half of the leaf margin was involved. The colour had changed at this stage to light brown.

At a later stage of growth the outer margins of the oldest leaflets died without the prior appearance of dead spots (Fig. 12). This was particularly the case with the Dwalganup variety, the affected leaves of which later had a tendency to become inrolled upwards.

Death of the oldest leaves of the potassium-deficient Mt. Barker plants often commenced in the form of light pinkish-cinnamon coloured spots which were not marginal, but were distributed over the upper surface of the leaflet (Fig. 12). In the first affected leaves all spots were relatively large, but in subsequently affected leaves numerous smaller spots occurred, followed by larger spots on the margins (Plate 2, Fig. D).

It was obvious from these experiments, that, on the basis of symptom manifestation, the Dwalganup variety was a much better indicator plant than Mt. Barker for potassium deficiency.

It was found that potassium deficiency caused a relatively greater reduction in top growth than root growth.

Nitrogen Deficiency

Nitrogen-deficient plants became dwarfed and showed a slight general yellowing. Leaf size was reduced, and the oldest leaves died in succession (Plate 3, Figs. A and B). The dead tissue was light brown in colour and appeared first at the margins, but soon involved the whole leaf and stalk. In the leaf margins the veins often remained green for some time after the surrounding tissue was dead (Plate 3, Fig. C).

Some older leaves showed a reddish-pink coloration which first appeared on the undersides and away from the margins (Plate 3, Fig. A). Later the colour was also visible in the centre of the upper surface, and was followed by death of the margin of the leaflet. The stalks of these older leaves also developed a reddish-pink colour (Plate 3, Fig. A).

This reddish-pink coloration was a feature of very young nitrogen deficient plants.

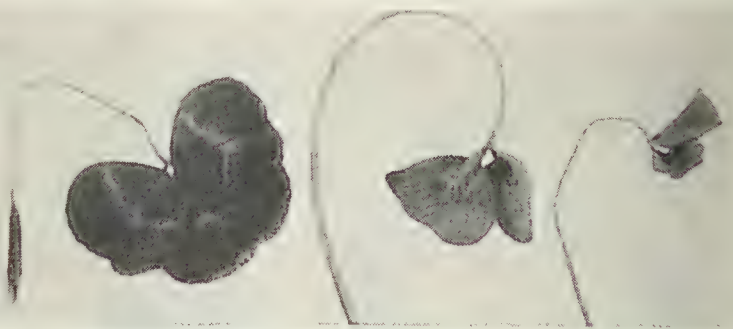


Fig. 8.—Calcium deficiency. When the collapse of the leaf stalk first occurs the leaf itself appears normal (left), but it soon withers and dies (centre and right).

Fig. 9.—Dwalganup and Mt. Barker varieties of subterranean clover grown in potassium deficient (left) and complete (right) nutrient solutions. Dwalganup is more affected than Mt. Barker by potassium deficiency.

As the plants aged, the death of the oldest leaves occurred without any prior pink coloration of either the leaflets or the leaf stalks (Plate 3, Fig. B).

In general, the symptoms of nitrogen deficiency in Mt. Barker, Tallarook, and Dwalganup varieties were similar, except that, in the early stages of growth, the reddening of the leaflets was more pronounced and more common in the Mt. Barker plants.

There was a marked tendency for the oldest leaves of the affected plants of each variety to be partly folded (Plate 3, Fig. A).

Magnesium Deficiency

The first symptoms of magnesium deficiency were a reduction in growth, and a slight yellowing of the plant. Shortly afterwards the first signs of a marginal reddening appeared on the upper and then on both surfaces of the oldest leaves (Fig. 13, Plate 4, Figs. A and E). This reddish colour was noticeably lighter and at first more diffuse in Mt. Barker as compared with Dwalganup and Tallarook plants (Plate 4, Fig. B). The reddish area gradually extended down the edges and towards the centre of the leaflets until the whole of the leaflet was affected except a small inverted " V " shaped green area at the base of the mid-rib (Fig. 13). Death of the reddish tissue commenced either at the edge or in the centre of the leaflet, and was followed by the death of the leaf stalk.

Some older leaves showed circular yellowish spots surrounded by the reddish tissue described above (Plate 4, Fig. C). Such spots also occurred in the leaves of plants subjected to other treatments, e.g., magnesium plus potassium deficiencies; magnesium deficiency plus excess manganese; and excess manganese alone.

Meanwhile, the marginal tissues of the younger leaves developed a marked yellowing before the appearance of the reddish colour described above (Plate 4, Fig. A).

Fig. 10.—Two deeply-lobed and dwarfed leaves from a potassium-deficient Dwalganup plant compared with a normal leaf (left).

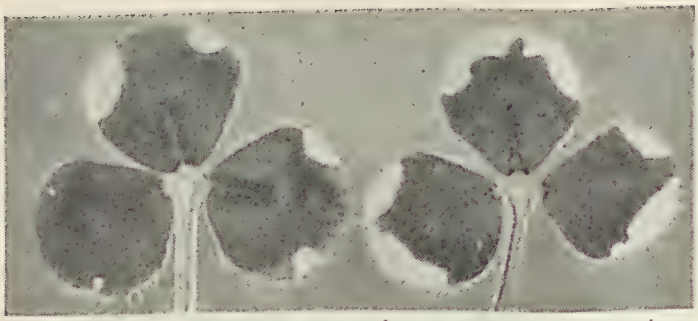


Fig. 11.—First necrotic symptoms of potassium deficiency in the oldest leaves of the Dwalganup variety.

Iron Deficiency

A general yellowing of the youngest leaves of the plant was the first symptom of iron deficiency (Plate 3, Fig. H). However, the rate of growth soon became very retarded, and the habit of growth of the Dwalganup variety in particular tended to be more prostrate than normal.

Iron deficiency produced a marked difference in the color of the markings which normally occurred in the leaflets of subterranean clover. In the leaves from normal plants, these markings were plum purple in colour, whereas in the case of iron-deficient leaves they were a carmine colour.

Light-brown dead areas appeared in the yellow young leaves and soon enlarged until the whole of the lamina was dead. In some younger leaves (all varieties) a marginal white necrosis followed by a puckering of the leaf, occurred. This symptom was very similar in appearance to that of copper deficiency (Plate 1, Fig. G).

Meanwhile a bright reddish (carmine) colour developed at the apex and spread around the margins of the oldest leaves. (Plate 3, Fig. H). This colouration occurred in the Mt. Barker plants for several weeks before plants of the Tallarook or Dwalganup varieties showed a similar leaf symptom. Death of this red marginal tissue did not necessarily occur.

The youngest leaves of the Tallarook variety developed the necrotic symptoms described above, whereas the leaves of the Dwalganup and Mt. Barker plants in the same pots remained almost free of such symptoms until two to three weeks later. Roots of iron-deficient plants were a pinkish-brown colour.

Phosphorus Deficiency

Phosphorus deficiency was characterized by a reduction in leaf size and growth, while the general colour of the affected plants was darker green, and the general habit of growth was more prostrate than normal (Plate 3, Fig. E).

Phosphorus-deficient Dwalganup plants were less leafy than normal plants, and their stems and leaf stalks took on a purplish colouration (Plate 3, Fig. G). Before death occurred the oldest leaves became pale golden-yellow and a few also developed a reddish-brown color (Plate 3, Fig. F). A less marked purplish colouration occurred in the leaf stalks of the Tallarook variety while with the Mt. Barker variety, phosphorus deficiency induced very little purpling of stems and leaf stalks. However, the oldest leaves of both varieties showed the same golden yellow colour as the Dwalganup plants. With some older leaves of the Tallarook variety there was a tendency

Fig. 12.—Necrotic symptoms caused by potassium deficiency in the older leaves of two varieties of subterranean clover. Top row—Dwalganup. Lower—Mt. Barker.

for the development of a purplish colouration in the bases of the leaflets around the mid-rib.

Phosphorus deficiency delayed the date of flowering and reduced seed setting.

The roots of phosphorus-deficient subterranean clover plants were brown, whereas those of normal plants were much lighter in colour. Phosphorus deficiency limited top growth more than root growth.

Fig. 13.—Top. Runner stem from a magnesium-deficient Dwalganup plant. The oldest leaves in turn show a marginal reddening. Bottom—Leaves showing progressive stages in the development of the reddening.

Excess Manganese

An excess of manganese caused a reduction in growth, and the youngest leaves developed a yellowing, the severity of which was dependent on the amount of iron available to the plant.

At the same time a characteristic red colour appeared around the outer margins of the oldest leaves. The colour was visible from the first on both leaf surfaces and gradually extended until about half the total area of the leaf was involved (Plate 4, Fig. G). This red tissue did not necessarily die.

Excess manganese symptoms somewhat resembled those of magnesium deficiency, but in the latter case the red colour soon involved the whole of the oldest leaves and was followed by death.

Molybdenum Deficiency

Symptoms of molybdenum deficiency are similar to those of nitrogen deficiency. This is because a lack of molybdenum affects both the capacity of root nodules to fix atmospheric nitrogen, and of the plant to utilize the nitrogen for its own vital processes. The number of nodules on the roots of molybdenum-deficient plants may actually be greater than normal.

The affected plants show symptoms of general yellowing and reduced growth (Plate 4, Fig. H). The stems are thin and the leaves small.

Sulphur Deficiency

As with molybdenum deficiency, a lack of sulphur prevents the plant from utilizing nitrogen for its own vital processes. Thus again the plants show symptoms of general yellowing, reduced growth, small leaves, and thin stems, characteristic of nitrogen deficiency. However, sulphur deficiency differs from molybdenum deficiency in that the former disorder results in a reduction in the number of nodules on the roots.

Boron Deficiency

The oldest leaves, first of the Dwalganup variety, and later of Mt. Barker and Tallarook plants, developed a characteristic bright-reddish coloration along the outer margins, similar to the depicted by Wallace (1951) in his colored photograph of boron deficiency in red clover. The colour was more intense, and occurred more extensively at first in the Dwalganup than in Mt. Barker or Tallarook leaf margins. Although it usually appeared simultaneously on both leaf surfaces, many leaves showed the colouration first on the under surface. The reddening extended into the centre of the leaflets in the interveinal tissue, the veins themselves remaining green for some time afterwards. Later, light-brown dead patches occurred on the red margins on either side of the mid-rib (Fig. 16). The actual point where the mid-rib reached the margin did not die until some time after the edges showed extensive necrosis.

Meanwhile, growth of the plants became retarded. The stalks of the younger leaves did not fully elongate, became somewhat thickened, and were often bent backwards in a wide arc (Fig. 14). The leaves themselves remained small and showed a marked tendency to be partly folded (Fig. 14).

Fig. 14.—Boron deficiency in the Tallarook variety of subterranean clover. The stalks of the younger leaves remain short and tend to be curved backwards in a wide arc. The leaves themselves do not fully unfold and their margins become yellow.

The shape of the youngest leaves was abnormal (Fig. 15), and they were also stiff and brittle. These effects gave the centre of the plants, particularly those of the Tallarook and Mt. Barker varieties, a rosetted appearance (Fig. 14).

The margins of the centre leaves became chlorotic, and patches of red later developed in this chlorotic tissue. A slight puckering of the margins of these leaves occurred.

Boron deficiency resulted in the death of the growing points of the plants (Fig. 16). This necrosis commenced in the bases of the youngest leaflets on either side of the mid-rib (Fig. 16), but soon involved the whole leaf.

In other slightly older leaves, the leaf stalks developed a necrosis which was first visible on the upper surfaces either as dark-brown patches (Fig. 17) or as one to several minute gall-like swellings. In the case of many of these leaves one only of the lower leaflets died at first and was folded back over the remaining two leaflets (Fig. 18).

A peculiar feature of some boron-deficient Tallarook plants was that a few leaves occurred in which the stalks of individual leaflets, but most commonly the terminal one, were very lengthened. One such leaflet is shown in Fig. 15. Root growth was reduced, and the laterals tended to be short and thickened.

Multiple Deficiencies

The following are details of the symptoms produced in subterranean clover grown in solutions deficient in two elements at the one time.

Potassium and Phosphorus Deficiencies

Whereas the symptoms of potassium deficiency became very acute in the plants grown in the simple potassium-deficient solutions, those in the solutions deficient in both potassium and phosphorus showed phosphorus-deficiency symptoms, but no potassium-deficiency symptoms until near the end of the experiments. However, even at this stage, the symptoms were much less acute than in the simple potassium-deficient plants.

Potassium and Nitrogen Deficiencies

At all stages of growth, the symptoms shown by the plants deficient in both potassium and nitrogen were solely those of nitrogen deficiency, i.e., potassium

Fig. 15.—*Left*—Normal leaf. *Right*—Youngest leaves of boron deficient Tallarook plant, showing their abnormal shape.

Fig. 16.—*Left*—Death of the growing point of a runner of a boron deficient Dwalganup plant. The margins of the next leaf were red, and dead patches were appearing. *Right*—Enlarged view of a leaf from the growing point of a Tallarook plant, showing that boron deficiency necrosis commences in the base of each leaflet. The margins of these leaflets were inrolled in their natural state.

deficiency symptoms were completely masked. It is of interest to note that a few plants which developed rhizobial nodules on their roots, showed characteristic potassium deficiency symptoms, whereas the remaining non-nodulated plants in the same pots showed nitrogen deficiency symptoms only.

Potassium and Calcium Deficiencies

The plants showed symptoms of both potassium and calcium deficiencies.

Potassium and Magnesium Deficiencies

The first symptoms which appeared in the plants grown in this solution were those of magnesium deficiency alone (after four weeks). A fortnight later potassium deficiency symptoms were also evident, and from this stage, the plants continued to show symptoms of both magnesium and potassium deficiencies. However, the reduction in leaf size of the Dwalganup plants was not as great as that of the plants of the same variety deficient in potassium alone.

Potassium and Iron Deficiencies

Initially, the plants showed typical iron deficiency symptoms, but after seven weeks in the cultures, potassium deficiency symptoms were also apparent.

Magnesium and Iron Deficiencies

The plants of all varieties soon showed marked iron deficiency symptoms. After five weeks some marginal reddening of the oldest leaves, characteristic of magnesium deficiency, occurred. However, at no stage was the marginal leaf reddening in these plants as pronounced as that in the simple magnesium-deficient plants, i.e., a concomittant iron deficiency virtually masked magnesium deficiency symptoms (Plate 4, Fig. E).

Magnesium and Phosphorus Deficiencies

The plants showed symptoms of both deficiencies. They were dark green with purple stems and brown roots (= phosphorus deficiency) and the margins of the oldest leaves were red (= magnesium deficiency). Later yellowing of the oldest leaves characteristic of phosphorus deficiency also occurred.

Magnesium and Nitrogen Deficiencies

In the first three to four weeks the oldest leaves of the plants showed magnesium deficiency symptoms (i.e., marginal reddening). These leaves finally died and from this stage the plants of each variety

Fig. 17.—Dead patch appearing on the upper surface of a young leaf stalk of a boron deficient Dwalganup plant. The lower right leaflet was commencing to wither.

Fig. 18.—Leaves from boron deficient plants showing the death of one leaflet which is folded over the other two. The margins of the latter were yellow.

grown in this solution showed symptoms of nitrogen deficiency only, i.e., the deficiency of magnesium in the plants was completely masked.

In a few cases, plants developed rhizobial nodules on their roots. Such plants showed magnesium deficiency symptoms, whereas other plants in the same pot showed nitrogen deficiency symptoms only (Plate 4, Fig. F).

The relative growth of the Dwalganup variety was reduced by this treatment to a much greater degree than that of either the Mt. Barker or Tallarook plants (Fig. 19).

Magnesium and Calcium Deficiencies

The plants developed symptoms characteristic of each deficiency although they were darker green in colour than the magnesium deficient control plants. Also the marginal colouration of the oldest leaves was at first brown in contrast with the bright red characteristic of simple magnesium deficiency (Plate 4, Fig. D). In later affected leaves this colour became more red.

Phosphorus and Calcium Deficiencies

Symptoms of both phosphorus and calcium deficiencies occurred.

Phosphorus and Nitrogen Deficiencies

Phosphorus and nitrogen deficient treatment produced an intense pink colouration in the leaf stalks and runner stems of all varieties, but of Dwalganup in particular. This was in striking contrast to the simple nitrogen-deficient plants (Plate 3, Fig. D).

In the simple nitrogen-deficient plants, such a colour (although less intense) occurred in the oldest leaves in the first few weeks of growth, but disappeared later following the seccessive death of these leaves. However, in the case of the plants deficient in both nitrogen and phosphorus, death of the oldest leaves did not occur to the same extent, and the surviving oldest leaves also became pink, first in the middle of the leaflets on the undersides and finally, on the upper surfaces as a mottled reddish pattern at first.

Phosphorus and Iron Deficiencies

Symptoms of both phosphorus and iron deficiencies occurred.

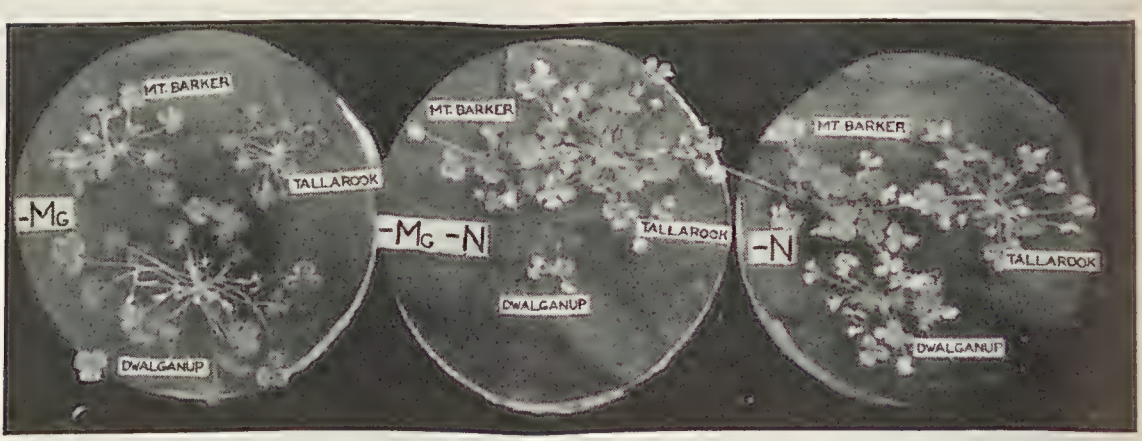


Fig.19.—Differential effects of three nutritional treatments (Left: Magnesium deficiency; Centre: magnesium and nitrogen deficiency; Right: nitrogen deficiency) on three varieties of subterranean clover. Magnesium deficiency reduced the growth of Mt. Barker most and Dwalganup least; Nitrogen deficiency had a more uniform effect on the three varieties. The combined (−Mg−N) deficiency caused a particularly drastic reduction in the growth of Dwalganup.

Nitrogen and Calcium Deficiencies

None of the characteristic symptoms of calcium deficiency occurred in the plants grown in this solution. However, the plants were darker green and, in the early stages of growth, showed a more intense pink colouration of the oldest leaves, than the simple nitrogen-deficient plants. Later these oldest leaves died.

Nitrogen and Iron Deficiencies

Iron deficiency symptoms were not as severe in these plants as in those deficient in iron only. However, the former plants did develop the pinkish brown roots, and the margins of the oldest leaves of the Mt. Barker plants the carmine colour characteristic of iron deficiency, but no death of the youngest leaves occurred.

The effect of nitrogen deficiency was evidenced by the marked dying of the oldest leaves.

Potassium Deficiency and Excess Manganese

Symptoms of both nutritional disorders were present in the plants. However, the marginal reddening of the oldest leaves, typical of excess manganese was not as evident in these plants as in the control receiving excess manganese only. Also, the amount of dying of the oldest leaves was less than that which occurred in the simple potassium-deficient plants.

Magnesium Deficiency and Excess Manganese

The plants showed much more acute symptoms than those which occurred in the plants growing in either the magnesium deficient solution or that with excess manganese respectively.

General growth was very dwarfed, the young leaves showed a marked chlorosis, and the oldest leaves developed marginal reddening followed by a light-brown necrosis. In some leaves circular yellow spots surrounded by red tissue occurred (Plate 4, Fig. C).

REFERENCE

Wallace, T. 1951. The Diagnosis of Mineral Deficiencies in Plants by Visual Symptoms. Plate No. 212, H. M. Stationery Office, London.

Book Review

COMMON FARM WEEDS ILLUSTRATED

Plant Protection Ltd., Butterworths Scientific Publications Ltd., London, 1952. (Price, 22s. 6d.)

This book of 172 pages, beautifully illustrated on fine art paper, has been produced to enable a person without technical knowledge to identify the common weeds on English farm lands. Each weed is clearly depicted by a double page of excellent half-tone plates—one of the seedling stage, the other of a mature plant with flowers and fruit. Botanical and common names together with brief non-technical description and notes are given. To assist in identification, the weeds are classified as arable weeds and pasture weeds, and further subdivided according to the colour of their flowers.

From the Australian point of view, " Common Farm Weeds Illustrated " suffers because of its English origin. Of the eighty weeds described, some fourteen are unknown here, a number are of minor importance, and many of our most troublesome weeds are outside the scope of this book. Consequently it would not serve as an infallible reference for the Australian farmer, but it covers its field simply, and with remarkable clarity, and would be of value to anyone wishing to identify the weeds of southern Australia.

[A. W. Harrison, B.Agr.Sc.]

SEED POTATO CERTIFICATION

LIST OF GROWERS, 1953

By W. A. DOWNIE, B.Agr.Sc., Agricultural Research Officer

A LIST of growers of seed potatoes, whose crops have been inspected at least three times in the field and conform to the standard of purity and freedom from disease required under the Seed Potato Certification Scheme, is appended. The produce of these crops may be sold as "certified" seed provided that the tubers are correctly graded and are contained in sealed bags bearing an official label.

Inspections of crops entered under this scheme are timed to coincide with definite stages in the growth of the plant. The first inspection is made approximately eight weeks after the average planting date for a district. At this stage, the plant is growing strongly and gives full expression to any virus diseases which may be present. This is particularly true with regard to the "mosaic" type of virus disease and, when present at this time, it is comparatively easy to demonstrate such diseased plants to the grower.

The second inspection is carried out usually when the plants are flowering. This inspection should reveal any "strangers" or off-type plants. It is at this stage also that the plants give an indication of attack by bacterial or fungal diseases.

Immediately following each of these inspections, the grower is expected to walk through his crops and "rogue" out any undesirables.

The third inspection is generally a final inspection with respect to the growing crop. The crop is now close to maturity and the plants should be going off evenly over the whole area. Any marked deviations from this entail the removal by the grower of the particular plants.

It is a constant struggle for a grower to maintain uniformity in any variety. Perhaps the main offender in this regard is the variety Up-to-Date. Each year a percentage of late stalks (bolters) appear and these have to be removed. Speaking generally, it can be said that late varieties tend to produce early off-types and early varieties tend to produce late off-types.

It is at this juncture of the potato-growing season that the list shown below is prepared for publication. The word "provisionally" is used in the heading to indicate that all crops listed have yet to undergo a rigid tuber inspection as a final check before they can be sold as certified seed potatoes. The list is published at this time to enable those engaged in the industry to negotiate for the purchase of reliable seed.

This short résumé has not covered in detail all the possible difficulties which a grower meets in the course of producing certified seed potatoes. However, it does convey some idea of the techniques adopted to achieve this object. The measures outlined, combined with the practice of ultimately planting the bulk crop from a small foundation plot planted and rogued on the tuber unit basis, enable growers to consistently conform to the high standards expected under the scheme.

LIST OF GROWERS OF PROVISIONALLY CERTIFIED SEED POTATOES, 1952

GREEN MOUNTAIN

Name.	Address.	Acres.
Allan, J. M. and R.	Whelan's L.B., via Leongatha	1½
Morter, T. G.	Nichol's-road, Leongatha	3½
McGrath, A. C.	Stony Creek	2
McGrath, W. J.	Stony Creek	4
McIndoe, R. E., Jnr.	Boorool Estate-road, Leongatha	1
McKenzie, I. N.	Nichol's-road, Leongatha	1
Powell, H., and Sons	Thorpdale	20
Smith, G. A.	Ward-street, Trafalgar	10

LATE CARMAN

Name.	Address.	Acres.
Congram, W. J. P., and Sons	Beech Forest, via Colac	3
Grimwood, R. A.	Laver's Hill, via Colac	7
Minchinton, E. F., and Sons	Beech Forest, via Colac	8
Simmons, J. C.	Wyelangta, via Colac	1
Towers, A. J., and Son	Beech Forest, via Colac	8

List of Growers of Provisionally Certified Seed Potatoes, 1952—(*continued*)

Name.	Address.	Acres.
KATAHDIN		
Collery Bros.	Kerrie, via Romsey	18
Dyer, M. H.	Gembrook	4
Knox, J., and Son	Pile Siding, via Beech Forest	8
McKenzie, A.	Wyelangta P.O., via Colac	4
O'Brien, R.	Weeaproinah, via Colac	9
Ryan, G. S.	Emerald	12
Stielow Bros.	Gembrook	4
Stielow, I.	Gembrook	5
Twaits, D.	Mary-street, Emerald	½
EXTON		
Berryman, F. J.	Thorpdale	3
Billing, E.	Shellcott's-road, Korumburra	6
Boadle, L. H.	Claretown, via Ballarat	12
Brown, D. B.	Wyelangta, via Colac	4
Cayzer, C. E.	47 Ogilvy-street, Leongatha	7
Collery Bros.	Kerrie, via Romsey	14
Easdown Bros.	Kinglake Central, via Whittlesea	8
Exton, A. C.	Kinglake East, via Whittlesea	7
Exton, A. P.	Pheasant Creek, via Whittlesea	50
Exton, C., and Sons	Kinglake, via Whittlesea	80
Exton, C., jnr.	Gembrook	5
Hillman, R. V., and Marslin, L. J.	Fumina South	7
Jarvie, R.	Orchard's-road, Kinglake, via Whittlesea	2
Kelly, J. M.	Kinglake West, via Whittlesea	6
Knox, J., and Son	Pile Siding, via Beech Forest	3
Labbett Bros.	Clark's Hill P.O., via Ballarat	13
Lawrey, L. K.	Kinglake Central, via Whittlesea	4
Minchinton, E. A., and Son	"Dorset Farm" P.B., Beech Forest	½
McGrath, W. J.	Stony Creek	3
McIndoe, R. E., jnr.	Boorool Estate-road, Leongatha	3
McLean, H.	Wright's-road, Warragul	7
Owen, F. J., and Sons	Pheasant Creek, via Whittlesea	25
Power, J.	Kinglake, via Whittlesea	7
Ryan, G. S.	Emerald	7
Stielow, I.	Gembrook	2
Tann, W. H., and Sons	Weeaproinah, via Colac	1½
Thom, J. R.	Kinglake Central, via Whittlesea	6
Toohey, T. J.	"The Chestnuts," Kinglake, via Whittlesea	2½
Ure, A. W.	Gembrook	17
Ward, S. H.	Neerim North	3
White, J., and Sons	"Elnaam," Neerim	4
UP-TO-DATE		
Baulch, S. G.	Beech Forest, via Colac	8
Berry, J. W.	P.B., Beech Forest, via Colac	4
Brauer, L. L.	Laver's Hill, via Colac	5
Butler, J.	Weeaproinah, via Colac	3
Cashin, E. F. and E. G.	Ferguson, via Colac	2
Congram, W. J. P., and Sons	Beech Forest, via Colac	10
Duke, J. S.	Beech Forest, via Colac	2
Minchinton, E. F., and Sons	Beech Forest, via Colac	14
Murchison, I. C.	Ferguson, via Colac	3
Pappin, J. R.	Beech Forest, via Colac	12
Perry, J. A.	Beech Forest, via Colac	8
Puls, A. B.	Beech Forest, via Colac	10
Shaw, J. L.	Ferguson, via Colac	9
Simmons, J. C.	Wyelangta, via Colac	2½
Skinner, A.	Ferguson, via Colac	2
Tann, W. H., and Sons	Weeaproinah, via Colac	5½
Witherow, J.	Beech Forest, via Colac	7
SEBAGO		
Barrett, J. M.	Wylangta, via Colac	5
Baulch, H. J.	"The Pines," Wyelangta, via Colac	6
Baulch, J. D.	Beech Forest, via Colac	1
Bayliss, H. L.	Kinglake Central, via Whittlesea	9
Berg, H. F.	Box 5, Trentham	6½
Berryman, F. J.	Thorpdale	7
Brauer, W. C.	Beech Forest, via Colac	2
Brown, C.	Wyelangta, via Colac	4

Name.	Address.	Acres.
SEBAGO—*continued*		
Butler, J.	Weeaproinah, via Colac	4
Chapman, L. J.	Larnder-road, Warragul	12
Congram, W. J. P., and Sons	Beech Forest, via Colac	3
Delzoppo, L. J.	Pheasant Creek, via Whittlesea	10
Deppeler Bros.	Beech Forest, via Colac	7½
Deppeler, D. J.	Beech Forest, via Colac	3
Dow Bros.	Ferguson, via Colac	28
Duggan, K. J.	Pheasant Creek, via Whittlesea	7
Dyball, A. H.	Kinglake, via Whittlesea	10
Ebbels, J. T.	Olinda P.O.	25
Exton, A. P.	Pheasant Creek, via Whittlesea	30
Exton, C., and Sons	Kinglake, via Whittlesea	8
Fletcher, W.	"Syringa," Toolangi-road, Kinglake, via Whittlesea	2½
Francis, J. E.	Ferguson, via Colac	5
Gloster, R. S.	Buffalo	3
Gordon, A.	Weeaproinah, via Colac	2
Graham, D. J.	Thorpdale	10
Hawkins, E. T.	Kinglake, via Whittlesea	13
Hillman, R. V., and Marslin, L. J.	Fumina South	4
Hobson, J. T.	Laver's Hill, via Colac	6
Jenkins, R. E.	Beech Forest, via Colac	1½
Jones, A. R.	Wright's-road, Warragul	23
Jones, F. M.	"Hilltop," Stony Creek	1½
Jones, P. H.	"Fair View," Fish Creek	6
Knox, J., and Son	Pile Siding, via Beech Forest	19
Kuhne, C. J.	McKinnon's P.O., via Leongatha	1
Labbett Bros.	Clark's Hill P.O., via Ballarat	5
Lawrey, L. K.	Kinglake Central, via Whittlesea	4
Matthews, J. N.	Box 7, Thorpdale	2½
Morrow, A. C.	Beech Forest, via Colac	5
Morrow, C. R.	Beech Forest, via Colac	4
Murchison, I. C.	Ferguson, via Colac	12
McGrath, W. J.	Stony Creek	12
McKenzie, A.	Wyelangta P.O., via Colac	2
McMahon, J. P.	Kinglake, via Whittlesea	10
Owen, F. J., and Sons	Pheasant Creek, via Whittlesea	24
Pearse, W. R.	Crossover, via Warragul	16
Peillon, R. E.	Laver's Hill, via Colac	7
Powell, H., and Sons	Thorpdale	4
Renzella, N. A.	Weeaproinah, via Colac	4
Robinson, L. M.	Thorpdale	6½
Ryan, G. S.	Emerald	4
Shaw, J. L.	Ferguson, via Colac	7
Simmons, G. J.	Wyelangta, via Colac	2
Skinner, F. T.	Ferguson, via Colac	3
Smith, G. A.	Ward-street, Trafalgar	3½
Tann, W. H., and Sons	Weeaproinah, via Colac	32
Thom, J. H.	Kinglake Central, via Whittlesea	4
Thom, J. R.	Kinglake Central, via Whittlesea	12
Toohey, T. J.	"The Chestnuts," Kinglake, via Whittlesea	5
Ward, S. H.	Neerim North	8½
Webster, S.	Laver's Hill, via Colac	1
White, J., and Sons	"Elnaam," Neerim	5½
SEQUOIA		
Allan, J. M. and R.	Whelan's L.B., via Leongatha	3½
Baulch, S. G.	Beech Forest, via Colac	4
Berg, H. F.	Box 5, Trentham	10
Berry, J. W.	P.B., Beech Forest, via Colac	1
Berryman, F. J.	Thorpdale	8
Boadle, L. H.	Claretown, via Ballarat	16
Boekel, P.	Main-road, Toolangi	4
Bordonaro, S.	"Sunny Bank," East Beenak-road, Gembrook	5
Brauer, L. L.	Laver's Hill, via Colac	5
Brown, D. B.	Wyelangta, via Colac	1
Butler, J.	Weeaproinah, via Colac	4
Carlyle, H. V.	Kinglake, via Whittlesea	5
Cashin Bros.	Ferguson, via Colac	6
Cashin, E. F. and E. G.	Ferguson, via Colac	4
Cashin, W.	Ferguson, via Colac	2½
Chapman, L. J.	Lardner-road, Warragul	8
Collery Bros.	Kerrie, via Romsey	8
Congram, W. J. P., and Sons	Beech Forest, via Colac	20
Court, I. G.	Box 53, Leongatha	1½

List of Growers of Provisionally Certified Seed Potatoes, 1952—(*continued*)

Name.	Address.	Acres.
SEQUOIA—*continued*		
Deppeler Bros.	Beech Forest, via Colac	9½
Deppeler, D. J.	Beech Forest, via Colac	7
Dow Bros.	Ferguson, via Colac	14
Duggan, K. J.	Pheasant Creek, via Whittlesea	7
Duke, J. S.	Beech Forest, via Colac	7
Dyer, M. H.	Gembrook	14
Easdown Bros.	Kinglake Central, via Whittlesea	4
Ebbels, J. T.	Olinda P.O.	12
Exton, A. C.	Kinglake East, via Whittlesea	7
Fletcher, W.	"Syringa," Toolangi-road, Kinglake, via Whittlesea	1
Francis, J. E.	Ferguson, via Colac	7
Gloster, R. S.	Bulfalo P.O.	5
Gordon, A.	Weeaproinah, via Colac	1
Graham, D. J.	Thorpdale	5
Hawkins, E. T.	Kinglake, via Whittlesea	9
Hobson, J. T.	Laver's Hill, via Colac	7
Horsfield, L. N.	Thorpdale	1½
Jarvie, R.	Orchard's-road, Kinglake, via Whittlesea	2
Jenkins, R. C.	Beech Forest, via Colac	5
Joiner, G. A.	Beech Forest, via Colac	8
Joiner, J. A.	Beech Forest, via Colac	8
Jones, A. R.	Wright's-road, Warragul	3½
Jones, P. H.	"Fair View," Fish Creek	3
Knox, J., and Son	Pile Siding, via Beech Forest	4
Kuhne, C. J.	McKinnon's P.O., via Leongatha	7
Kuhne, R.	Nichol's-road, via Leongatha	5
Labbett Bros.	Clark's Hill P.O., via Ballarat	7
Lawrey, L. K.	Kinglake Central, via Whittlesea	4
Maskell, W. A.	Rochford, via Woodend	2
Matthews, J. N.	Box 7, Thorpdale	2½
Minchinton Bros.	Ferguson, via Colac	75
Minchinton, E. A., and Son	"Dorset Farm P.B., Beech Forest, via Colac	15
Minchinton, E. J. and J. F.	"Chandra," Ferguson, via Colac	10
Minchinton, L.	Beech Forest, via Colac	1½
Morrow, A. C.	Beech Forest, via Colac	5
Morrow, C. R.	Beech Forest, via Colac	8
Murchison, A. M. J.	Ferguson, via Colac	25
Murchison, I. C.	Ferguson, via Colac	7
McGrath, A. C.	Stony Creek	4
McGrath, W. J.	Stony Creek	8
McIndoe, R. E., jnr.	Boorool Estate-road, Leongatha	3
McKenzie, A.	Wyelangta, via Colac	½
McKenzie, I. N.	Nichol's-road, Leongatha	5
McMahon, J. P.	Kinglake, via Whittlesea	7½
Owen, F. J., and Sons	Pheasant Creek, via Whittlesea	57
Parker, G.	Gembrook	8
Pearse, W. K.	Crossover, via Warragul	5
Perry, J. A.	Beech Forest, via Colac	1
Powell, H., and Sons	Thorpdale	6
Power, J.	Kinglake, via Whittlesea	6
Puls, A. B.	Beech Forest, via Colac	10
Redman, V. L.	Barramunga	7½
Ryan, G. S.	Emerald	8
Shackleton, H. G.	Thorpdale	5
Simmons, J. C.	Wyelangta, via Colac	1
Skinner, A.	Ferguson, via Colac	3
Skinner, F. T.	Ferguson, via Colac	15
Smith, G. A.	Ward-street, Trafalgar	3½
Sprague, G. A.	Weeaproinah, via Colac	½
Stielow Bros.	Gembrook	38
Stielow, I.	Gembrook	1
Tann, W. H., and Sons	Weeaproinah, via Colac	7
Thom, J. H.	Kinglake Central, via Whittlesea	10
Thom, J. R.	Kinglake Central, via Whittlesea	10
Toohey, L. F.	Pheasant Creek, via Whittlesea	48
Toohey, T. J.	"The Chestnuts", Kinglake, via Whittlesea	25
Towers, A. J., and Son	Beech Forest, via Colac	10
Turner, R. W.	Silvan	10
Twaits, D.	Mary-street, Emerald	1½
Ure, A. W.	Gembrook	3
Waddell, R.	Beech Forest, via Colac	2
Ward, S. H.	Neerim North	3
Webster, S.	Laver's Hill, via Colac	10
White, J., and Sons	"Elnaam," Neerim	3
SNOWFLAKE		
Boadle, L. H.	Claretown, via Ballarat	18
Gooch Bros.	Wheatsheaf P.O., via Daylesford	18
Haintz Bros.	Mt. Prospect P.O., via Creswick	15
Labbett Bros.	Clark's Hill P.O., via Ballarat	6
Toomey, E.	Trentham	37

Jobs in the Orchard

Spray apricot trees at leaf fall with Bordeaux 15 : 15 : 100 for the control of shot hole or scab.

Spray grapefruit trees with 2 : 4 : D solution 22 p.p.m. of the sodium salt, before the end of May for the prevention of winter drop.

Overhaul spraying outfits. They will then be ready for next season's first sprays in July.

Prune deciduous fruit trees and vines.

Plant young fruit trees during June. Planting in June is preferable to July planting.

Plough out central drainage furrow for removal of surface water during winter.

Install extra underground drains where necessary.

Examine trees closely for presence of bryobia mite eggs and San Jose scale.

Now is the time for a general clean up of odd jobs, such as repairing fences and buildings, as this is the only period of the year in which an orchardist is not fully occupied with routine orchard work.

Increased Production

As previously mentioned, the production on the three farms has increased each year since 1948–49 and, to show the overall progress made on the three farms, Table 5 has been prepared in manner similar to Table 3, except that the particulars are shown for each year instead of for each feeding treatment.

At Rochester the production has increased each year in almost identical fashion with the increase obtained by the different feeding treatments, and this would suggest that the improvements in farming methods, pastures, equipment, and buildings have been as beneficial as the supplementary concentrates. About £3,000 was spent on concentrates during the three years of the trials in the Rochester district, and it would appear that this money could have been put to better use by investing it in permanent improvements on the farm.

Weighing, sampling and recording pasture growth.

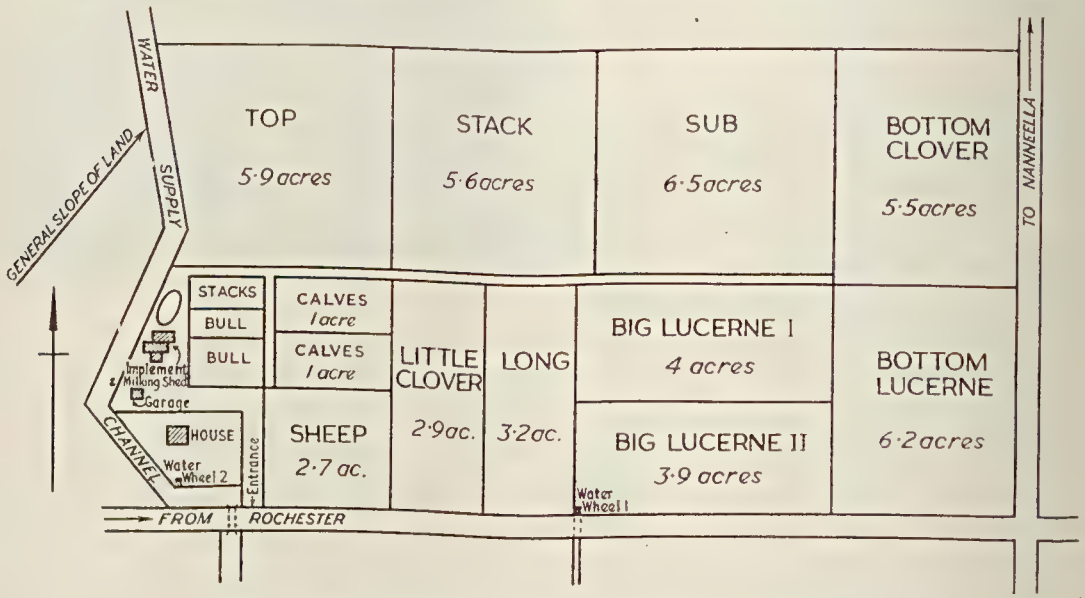
TABLE 5.—COMPARISONS OF THE INFORMATION COLLECTED FOR THE DIFFERENT YEARS ON THE THREE FARMS IN THE FEEDING TRIALS IN THE ROCHESTER DISTRICT.

	Unit.	1948–49.	1949–50.	1950–51.	1951–52.
Irrigation Water and Rainfall—					
Irrigation water used	ac. ft.	282	233	310	307
Irrigation water applied per acre	in.	21·95	18·12	24·18	23·93
Rainfall	in.	16·84	25·67	23·71	17·09
Rainfall and irrigation water per acre	in.	38·79	43·79	47·89	41·02
Milk and Butterfat Production—					
Cows milked	No.	110	117	122	129
Milk produced	lb.	742,627	790,245	850,801	861,972
Butterfat produced	lb.	34,601	37,278	39,734	40,845
Production Information—					
Butterfat per acre of farm	lb.	190	205	218	224
Butterfat per acre irrigated	lb.	225	242	258	265
Butterfat per acre foot of water (irrigation water and rainfall)	lb.	315	319	326	317
General Information—					
Calves weaned	No.	22	38	42	39
Superphosphate used	tons	27	27	21	34
Hay conserved	tons	91	113	102	119
Bulls, young cattle, horses, and sheep in "Cattle Equivalents"	No.	44	39	48	43
Supplementary Feeding—					
Roughage (hay and chaff)	tons	89	96	97	109
Concentrates	lb.	20,000	68,680	90,550	98,510
Theoretical Calculation—					
(*a*) Cattle which supplementary feed would maintain	No.	29	43	46	51
(*b*) Butterfat produced as Cattle Equivalents	No.	95	102	109	112
(*c*) Stock carried (Cattle Equivalents)	No.	154	156	170	172
(*d*) Cattle Equivalents ($b + c$)	No.	249	258	279	284
(*e*) Cattle Equivalents carried by pastures ($d - a$)	No.	220	215	233	233

Pasture Information

In conjunction with the concentrate feeding trials, an attempt was made to measure the growth of grass and the amount grazed by the milking cows on each of the properties. It was later realized that the accuracy of this information depended upon personal calculations, they soon got behind. For the Rochester district, about half of the calculations were made.

On Messrs. J. D. Pierce and Son's farm, it was found that during 1949–50 each cow grazed an average of about 21 lb. of dry matter or 100 lb. of green pasture per



Plan 3.—General layout of G. F. Furtiere's farm at Nanneella.

factors such as the interest of the officer doing the work, the particular technique applied by this officer, and the co-operation between the officer and the property-owner. When officers were changed frequently, as occurred in these feeding trials, the measurements rose or fell with the officer.

Another factor which had a bearing on the results was the grazing system adopted by the property owner. More accuracy was obtained on Messrs. J. D. Pierce and Son's farm where the cows were grazed in one paddock for 6 or 7 days before being moved to a fresh paddock which had been rested, than on Mr. J. H. Windle's property where the fences were so inadequate in the first two years of the trials that the pastures were grazed more or less continuously, or on Mr. Oliver's farm where night paddocks were used and where, with paddocks of various sizes, there was no regular day for moving the cows when the pasture measurements were to be taken.

Much calculation is necessary with this work, and as few of the officers were engaged long enough to become familiar with the day throughout the year. The monthly variations in the amount of dry matter grazed were from nil to 31 lb. In 1950–51, when the cows were not receiving any concentrates, they grazed an average of about 16 lb. of dry matter equal to 80 lb. of green pasture per day throughout the year. Again the variations were considerable, ranging from 8 to 31 lb.

During 1949–50, the average daily amount of dry matter grazed on Mr. J. H. Windle's farm was 33 lb. per cow, equal to 150 lb. of green pasture and on Mr. Oliver's farm 40 lb., equal to 200 lb. of green pasture. These figures must be considered high and the variations were high, ranging from 6 to 74 lb. of dry matter per cow per day on Mr. Windle's farm and from 19 to 56 lb. on Mr. Oliver's. Just how accurate any of these figures are is unknown, as this is a first attempt to gather this type of information.

One most useful piece of information which has emanated from these trials has been that a very large proportion of grass rots in the paddock without ever being grazed.

While it is not possible to make an exact assessment of the amount of food lost in this manner, it must be very considerable. Similar information has been obtained on all farms. On Messrs. J. D. Pierce and Son's farm in 1949–50 it was found that 311 tons of dry matter grew on the 46·4 acres of irrigated pastures. The milking cows grazed nearly 100 tons of it, 45 tons was conserved for hay and, while no attempt was made to measure the amount of grass grazed by the young stock, it would be considerably less than 25 tons, making a total of under 170 tons. A loss of approximately 45 per cent. of pasture growth is indicated.

The loss was represented in the death and decay of the bottom leaves of the grasses and clovers, losses in the curing of hay and losses in the trimming of the paspalum pastures with the mower every few weeks. During 1951–52, when production was higher on the three farms, the pastures were utilized much better. By this time the fences on Mr. J. H. Windle's property had been rebuilt.

Indications are that the losses on pastures outside the irrigation areas are much greater, due to the decay of dry feed standing in the paddocks through the summer and autumn.

Herd Test Data

Milk and butterfat production as measured by herd test data was found to vary so much from the actual milk and butterfat that could be accounted for that the figures have not been used in the comparisons, but this does not detract from their use as a comparison between individual cows. With herd test data, certain cows are exempt from test. Many produce for a longer lactation than 273 days and some that do not calve are milked through a second season. Further, there are cows which produce most of their milk and butterfat in one season, but as they complete their lactations after 30th June, they are placed in the herd average of the next season. This does not apply so much at Rochester where dairy farming is decidedly seasonal, with practically every cow calving within about six weeks in the late-winter—early-spring. Few cows were carried over in the herd test from one year to the next during the trials in these three herds.

A comparison of actual butterfat production accounted for with herd test production is shown in Table 6.

Seasonal Dairy Farming Under Irrigation

The seasonal nature of dairy farming on permanent irrigated perennial pastures is shown on Table 7 by using total quantities of butterfat sold to the factory during each month of the year. The figures are set out for method of concentrate feeding and clearly indicate that the concentrates have more effect in lifting production in the flush of the season rather than during mid-winter.

Pressing grass hay on Mr. Oliver's farm.

TABLE 6.—HERD AVERAGES IN POUNDS OF BUTTERFAT, AS SHOWN BY (I) THE HERD TEST AND (II) ACTUAL PRODUCTION ACCOUNTED FOR ON THE FARM AND AT THE FACTORY.

Herd Owner.	H. E. Oliver.		J. D. Pierce and Son.		J. H. Windle.	
	Number of Cows.	Average Butterfat.	Number of Cows.	Average Butterfat.	Number of Cows.	Average Butterfat.
		lb.		lb.		lb.
1948–49—						
Herd Test	29	394	33	357	36	339
Actual	33	352	37	327	40	273
1949–50—						
Herd Test	38	392	31	388	29	332
Actual	43	325	37	346	37	284
1950–51—						
Herd Test	50	390	35	347	39	333
Actual	47	353	37	327	38	309
1951–52—			G. F. Furtiere			
Herd Test	41	358	34	311	41	332
Actual	45	307	42	333	42	311

TABLE 7.—MONTHLY PRODUCTION UNDER VARIOUS CONCENTRATE FEEDINGS.

Month of Year.	1948–49.	No Concentrates.	Crushed Oats or Low Protein Content Concentrates.	Crushed Oats and Linseed Meal or High Protein Content Concentrates.
July	350	329	387	384
August	630	1,609	1,384	1,374
September	2,233	3,624	3,615	3,582
October	4,071	4,810	4,722	5,384
November	4,622	4,700	5,024	5,509
December	4,515	4,428	5,019	5,287
January	4,376	4,145	4,705	4,987
February	3,614	3,466	3,774	4,212
March	3,470	3,280	3,621	4,039
April	2,805	2,367	2,816	3,271
May	1,900	1,696	2,033	1,949
June	806	770	955	662

When studying this table, remember that the figures in Col. 1 are for the three farms in one year, whereas the figures in the other columns are for the same three farms each in a different year. The same applies to Table 3.

Condition and Health of the Cattle

During the course of the trials the condition of the cattle in all herds has been good and at no time were there any visible signs of improvement in, or loss of, condition due to the feeding treatments. Similarly, the health of the cattle in the herds at Rochester was good throughout the course of the trials, and it was not affected by the different feeding treatments.

ACKNOWLEDGMENT

It is desired to record appreciation for the co-operation received in the conduct of these trials from Messrs. H. E. Oliver, J. H. Windle, J. D. Pierce and Son, and, later, Mr. G. F. Furtiere, and also by Mr. Boyd and his staff at the Rochester Co-operative Butter and Canning Co. Ltd.

REGISTRATION OF STALLIONS

Thirty-Third Annual Report

by R. J. deC. Talbot, B.V.Sc., Chief Veterinary Inspector

STALLIONS registered under the Horse Breeding Acts for the year 1952–53 totalled 764, comprising 86 draught, 228 light, and 450 pony stallions. This is a decrease of 36 from the number registered for 1951–52.

Since 1939, in which year over 1,000 draught stallions were registered, the draught horse industry has rapidly declined, and the number registered at present (86) is the lowest since the Horse Breeding Act came into force.

During the year under review, the number of stallions examined by the veterinary staff was 229, of which 27 were draughts, 53 light, and 149 pony stallions. Of these 17 were refused registration because of unsoundness, and 14 because they were considered to be below a reasonable standard in respect of type and conformation. One hundred and ninety-eight stallions were passed for registration, a decrease of 28 on the previous year.

TWO-YEAR-OLD COLTS

The amending Horse Breeding Act now provides for the registration of two-year-old colts, the owners of which desire to use them for service.

Owners must make application for registration on the prescribed form, and such application must be accompanied by a fee of £1. The colts must be submitted for examination by a veterinary officer, and, if passed, will be registered as colts for one year.

During the year under review, 13 colts, comprising 3 draughts, 4 light, and 6 ponies, were examined and all were registered.

EXAMINATION OF MARES

Breeders are reminded that, under a voluntary scheme, stud-book draught mares may be submitted for examination for soundness. A fee of £1 is charged for the examination, and certificates for soundness are issued for three-year-olds and for four-year-olds, and life certificates for mares five years old and over.

In the past, many owners have availed themselves of the opportunity of having their mares examined, and it is hoped that during the coming season stud breeders will present at least some of their mares for examination.

APPEALS

During the year, two appeals against the decision of the examining veterinary officers were held and both were dismissed.

PARADES FOR THE COMING SEASON

Where possible, arrangements will be made to examine stallions at centres most convenient to those owners from whom applications have been received. Applicants should state which main town would be suitable for them to present their stallions for examination, and they will, in due course, be advised of the date, time, and place arranged for the examination.

Provided owners forward their applications by the 1st July as required, it is felt that, by such an arrangement, every stallion will be examined before the commencement of the breeding season.

Applications for registration must be made on the prescribed forms before the 1st July, and must be accompanied by a fee of £1 10s. (£1 for registration, and 10s. for compensation fee) in respect of stallions fifteen years of age and under, and a fee of £1 1s. in respect of stallions 16 years of age or over 16 years.

The necessary forms may be obtained from the Chief Veterinary Inspector, Live Stock Division, Department of Agriculture, Melbourne, C.2.

Changes of ownership must be notified without delay so that certificates of registration can be endorsed accordingly. Registration expires within thirty days of change of ownership unless the required notice is given.

SUMMARY OF STALLION EXAMINATIONS, 1951-52.

	Draught.		Light.		Pony.		Total.	
	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.
	34	26	78	63	158	137	270	226
	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.
Ring Bone	..	..	2	2·56	1	0·63	3	1·11
Bone Spavin ..	1	2·94	7	8·97	9	5·70	17	6·30
Bog Spavin	1	2·94	..	..	1	0·63	2	0·74
Curb	1	2·94	3	3.85	1	0·63	5	1·85
Chorea	1	2·94	..	..	..	..	1	0·37
Unsoundness ..	4	11·76	12	15·38	12	7·59	28	10·37
Disapproval ..	4	11·76	3	3·85	9	5·70	16	5·92
Total ..	8	23·52	15	19·23	21	13·29	44	16·29

SUMMARY OF STALLION EXAMINATIONS, 1952-53.

	Draught.		Light.		Pony.		Total.	
	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.
	27	24	53	39	149	135	229	198
	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.
Bone Spavin ..	..	..	6	11·32	4	2·68	10	4·37
Curb	..	..	3	5·66	1	0·67	4	1·74
Ring Bone	..	..	..	..	1	0·67	1	0·44
Side Bone	2	7·40	..	..	..	..	2	0·87
Unsoundness ..	2	7·40	9	16·98	6	4·02	17	7·42
Disapproval ..	1	3·70	5	49·43	8	5·37	14	6·11
Totals ..	3	11·10	14	26·41	14	9·39	31	13·53

LIST OF UNREGISTERED STALLIONS RETAINED BY OWNERS FOR USE WITH THEIR OWN MARES.

Under the provisions of the Horse Breeding Acts, the owner of any stallion, the registration of which has been refused, may on payment of a fee of £1 per annum, and notification to the Chief Veterinary Inspector, retain such stallion for use with his own mares only.

Name.	*Age and Class.	Owner and Address.
Un-named	A. L.	C. C. Connelly, Box 67, Birchip
Basil	4 L.	H. M. Fisher, Riley-street, Picnic Point, Bairnsdale
Bell Boy	5 P.	C. K. Hill, Hanson-street, Corryong
Bonny Leo	A. P.	J. R. O'Brien, Middle Creek
Boy Caledon	A. T.	Naughton Bros., Cobungra Station, Omeo
Bren	A. L.	R. A. Stewart (Mrs.), Hordern Vale, via Lavers Hill
Bryanvale Ken	4 D.	P. Kenneally, Williams-avenue, Dandenong
Carman Star	A. P.	P. A. Huggins, Jnr., Tongio
Carpentier	A. T.	J. Russell, Carngham
Danny Boy	A. L.	W. Meagher, Danyo
Dark Fentons	4 L.	T. Stephenson, Fenton's Creek
Don Sails	A. P.	R. Metherall, "Leighlands," Tooradin
Dunderdale Gentleman George	5 P.	N. Brindisi, McLaren-street, Upwey
Flash	A. P.	A. F. Sanders, 18 Ross-street, Sale
Glendallo Grey Isles	5 P.	W. A. Buckleigh, Beaconsfield
Gold Mine	4 L.	W. Rinaldi, Emu
Goldie	A. P.	J. L. Sullivan, Whitelaw
Goldie's Pride	5 P.	T. C. Phelan, "Sunnydale," Booroolite, via Mansfield
Gum Park Prince Boy	3 D.	J. A. Beattie, "Lovely Banks, Telford
Jack's Joke	6 L.	J. Sutton, Logan
John McElwyn	A. P.	D. A. McIntyre, "Mountside," Winchelsea
La-Di-Da	A. L.	B. Treween (Miss) "Orana," Sims-road, Montmorency
Lucky Desire	6 L.	J. Cottrell, Rushworth
Lyndale Trump	4 P.	H. A. Arnold, Box 12, Warracknabeal
Model	A. D.	G. B. Wilson, Paaratte
Monty	5 L.	K. E. Cross, Box 12, Lakes Entrance
Nippy Don	4 L.	C. F. Briggs, Culbertson-street, Ruthergien
Patches	A. P.	W. Frappell, Shepparton
Play On	5 P.	C. Hay, P. B., Terang
Pop's Delight	5 L.	H. Hargreaves, Kurraca West
Rainbow	3 P.	E. R. Mugavin, Lilydale
Rajpipla	A. T.	H. G. Simmonds, Docker
Royal Copy	6 L.	A. McLeod, Marnoo, via Stawell
Silver Pride	A. P.	J. Brown, "Kelvin Grove," P.B., Numurkah
Silver Style	4 P.	G. Murphy, Box 8, Kerang
Smart Lad	A. T.	H. Dunbar, Box 58, Traralgon
Smoky	4 P.	L. W. Beach, "Mission Banks," Birregurra
Socks	A. P.	C. G. Murphy, Dunrobin, Casterton
Son of War	4 P.	C. S. Fletcher-Butcher, 426 Graham-street, Port Melbourne
Star Actor	A. L.	G. Lindsay, Jnr., King Valley
Tiger	A. L.	T. H. Oborne, Ondit
Twylight	3 P.	T. Newton, Clancy's-road, Korumburra
Victor	A. P.	J. Dunstan, Hazelwood-road, Morwell
Wee Cedric	A. P.	A. H. Cuthbertson, Hallora
Wee Jackie	A. P.	A. B. Cecini, Burnside-road, St. Arnaud
Winall Lad	5 L.	M. K. Boyle (Miss), Longford
Worthy Count	6 L.	D. M. Simons (Mrs.), Ballarat-road, Rockbank

* Age in years; A., Aged; D., draught; L., light; T., thoroughbred; P., pony.

Collar Rot in Citrus

Collar rot is the most frequent cause of poor condition and ultimate death of lemon trees. A tree which is yellowish on one side should be closely inspected, particularly where the main trunk enters the soil. If the bark is cracked in this region it is usually a fair indication that collar rot has set in. There may also be considerable exudation of gum. The disease is favoured by poorly-drained soil and one essential in protecting a lemon plantation is to choose a naturally well-drained situation. Central drainage furrows between trees during the winter will help to remove surplus surface water. Where necessary, underground tile drains should be laid. The soil should not be ploughed right on to the trunks of the trees, however, because this creates another condition favourable to the disease. The piling of poultry or stable manure around the base of the trees also increases the risk of infection.

Lemons on citronelle or rough lemon rootstock are more susceptible than those on sweet or sour orange. Trifoliata rootstock is highly resistant to collar rot.

In the early stages of the disease the tree may be saved by cutting away all decayed bark and baring the main roots of soil to make sure that they are free from damage. The wound should be covered with a protective coating of Bordeaux paste, 1½ lb. bluestone in ½ gal. water and 2 lb. slaked lime in ½ gal. water. Combine the two solutions.

[Contributed by the Horticultural Division.]

VICTORIAN F.A.Q. WHEAT

Analysis of 1953 Sample

By E. J. O'Brien, B.Sc., A.A.C.I., Senior Chemist

THE ceremony of the fixing of the standard weight for fair average quality wheat for the Victorian crop of 1953 took place on March 6. Samples from 210 locations had been received by the corn trade section of the Melbourne Chamber of Commerce and had been thoroughly mixed. The average of eight determinations made on a 1 litre Schopper Chrondrometer was corrected to the 20 litre scale and the weight for this season was fixed at 64¾ lb. per bushel. A sample, supplied by courtesy of the chamber, has now been examined and the results are compared with those of previous years in the following tables.

WHEAT

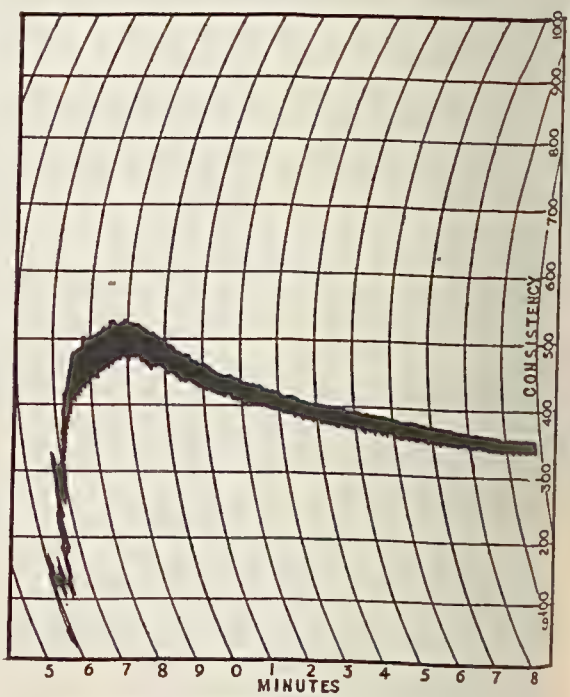
The grains were well filled and somewhat paler in colour than usual. The high bushel weight is a true indication of the general cleanliness of the sample and of its milling quality.

The protein content is virtually unchanged from last year at 9·6 per cent. Over the past few years there has been a steady increase in the Pelshenke figure. Whilst the change is not marked, it is indicative of a progressive improvement in the potential quality of the wheat varieties sown.

The high yields of the past seasons have not been conducive to high protein and consequently the generally low protein level experienced in Victoria for the last few years has been and remains the major factor governing wheat quality. It should be recognized that all these results refer to a single average sample; some wheat of better quality is available whilst some is inferior. The effect of variety on quality as measured by the Pelshenke figure and the Farinograph data and ultimately by the baking test is largely masked by a deficiency of protein whereas, with an adequate amount of this vital constituent, the full potentialities of the wheat may be developed.

FLOUR

The cleaned, conditioned wheat milled easily to give a normal yield of bright flour.



Farinogram of 1953 Sample of F.A.Q. Wheat

As is usual in Victorian flour the diastatic activity as shown by the Maltose Figure and the Gassing Power is inadequate and must be supplemented by malt additions for normal bakery procedures. The dough lacks stability and must be carefully handled to produce good bread.

The baking test used for these tests is rather severe and emphasises the effect of excessive amounts of improving agents such as potassium bromate on loaf volume and quality. However, some potassium bromate is required under normal conditions and doughs, properly fermented and matured, produce good bread.

There should be no noticeable difference in either mills or bakeries in the changeover from last season's wheat or flour; within the limitations imposed by the protein level this season's wheat should be satisfactory to all sections of the community.

TABLE 1.—ANALYTICAL RESULTS—WHEAT.

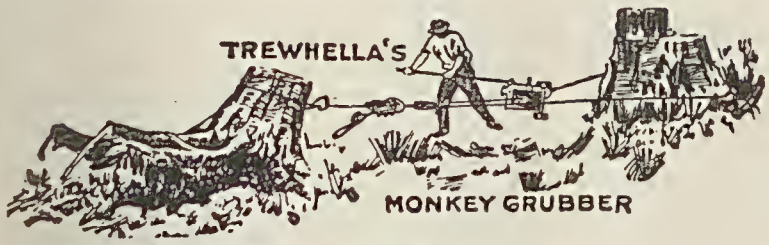
—	1946.	1947.	1948.	1949.	1950.	1951.	1952.	1953.
Moisture (per cent.)	11·7	11·2	11·6	11·7	11·9	11·4	11·3	11·7
Impurities (screenings) (per cent.) ..	4·7	3·9	5·9	4·0	5·5	4·1	3·5	2·5
Ash (per cent.)	1·36	1·22	1·22	1·33	1·34	1·29	1·36	1·42
Protein (N × 5·7 per cent.)	11·8	11·2	9·8	10·5	10·1	8·9	9·5	9·6
Bushel weight (lb.)	62½	63½	60½	63½	64	63	64	64¾
Pelshenke figure (min.)	32	38	36	34	33	34	38	39

TABLE 2.—ANALYTICAL RESULTS—FLOUR.

—	1946.	1947.	1948.	1949.	1950.	1951.	1952.	1953.
Moisture (per cent.)	14·0	13·5	14·4	14·0	14·4	13·3	14·0	13·0
Yield (per cent.)	70·3	70·3	70·0	70·0	70·0	70·0	70·0	70·0
Ash (per cent.)	0·43	0·41	0·40	0·46	0·43	0·46	0·46	0·47
Protein (N × 5·7) (per cent.)	10·5	9·5	8·2	9·2	8·7	7·9	8·2	8·5
Wet gluten (per cent.)	31·3	31·7	28·1	27·5	29·1	23·0	25·6	25·5
Dry gluten (per cent.)	10·3	9·8	9·3	8·7	9·5	7·4	8·5	8·3
Water Absorption (Farinograph)(per cent.)	60·0	57·0	53·0	54·5	55·2	56·0	56·0	58·4
Valorimeter No. (Farinograph) ..	38	40	40	32	36	34	42	40
Maltose figure (mgm. maltose per 10 gms. flour)	111	93	80	90	85	85	102	96
Gassing Power (cc. per 100 gm. flour in 5 hours)	820	680	545	665	620	815	660	720

TABLE 3.—STANDARD BAKING TESTS (100 GM. FLOUR)—LOAF VOLUME IN CC.

	1946.	1947.	1948.	1949.	1950.	1951.	1952.	1953.
Basic	477	450	440	460	410	395	360	397
Basic + malt + phosphate	550	510	510	480	470	445	470	465
Basic + malt + phosphate + bromate	555	540	555	465	545	455	470	430



Is a simple arrangement that multiplies the power at the handle 260 times—handy to use, easy to move, quickly rigged, and works in roughest country. Standard equipment pulls trees and stumps from 1½ acres without changing anchor. Many other time- and labour-saving features. Catalogue with pleasure.

TREWHELLA BROS. PTY. LTD., TRENTHAM

Garden Notes for June

By
GEORGE HYAM, Horticultural Supervisor

THE FLOWER GARDEN

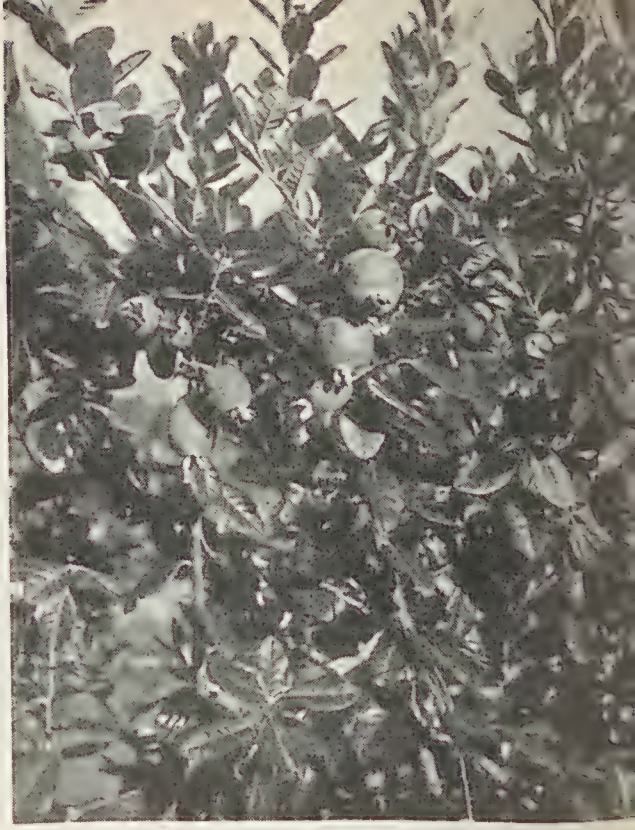
Useful Ornamentals

HOME gardeners about to plant deciduous trees and shrubs during the next few weeks and perhaps evergreens next spring might well consider the inclusion of some of the species having uses other than decoration or shade. Quite a long list could be given but only those which are more readily obtainable are included in this review.

In addition, quite a good case could be made for the judicious inclusion of specimens of the more common fruits in an ornamental layout, especially citrus species such as oranges, lemons, and grapefruits, if sufficient space and suitable sites can be found so that their normal cropping is not interfered with. Apart from their other uses, these species and those reviewed hereunder; all have merits for their flowers or foliage effect, apart altogether from their other uses.

FEIJOA SELLOWIANA, THE PINEAPPLE GUAVA.

This species is comparatively well known as an ornamental shrub on account of its white and purple flowers which have a large tuft of scarlet stamens. The flowering period is quite long, usually from late September until well into December. The foliage is glossy green on the super surface and silvery grey on the underside which makes this evergreen species attractive at all times. Feijoas can grow to 15 ft., but they can be kept at any height from 6 ft. upwards. Many are growing feijoas as a shrub without realizing that its fruits are not only quite edible but also of an attractive flavour reminiscent of pineapple from whence they derive their common name. But those who have tried these fruits before full maturity may have been disappointed as they mature differently to most other fruits and when immature are

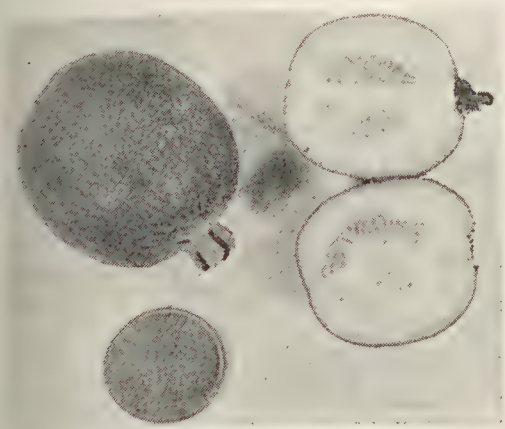


First crop on a three-year-old Feijoa.

almost as astringent as alum. Another peculiarity is that even when matured sufficiently for eating, they retain their dull green colour and furthermore, they have not arrived at full maturity when they first fall from the tree. This fall takes place in autumn and early winter and as in their production of flowers, continues over an extended period. The method of use is to collect the fallen fruits and store them in a cool place until they become slightly soft and emit a fragrant odour, and then at that stage, they can be classified as a choice dessert fruit or as a good ingredient of fruit salad. They can also be made into jam or jelly.

Feijoas are raised from seed or cuttings or layers but some seedlings fail to bear fruit and so every endeavour should be made to get plants raised from wood from a known fruiting specimen. If such is in a nearby garden, the cuttings are not difficult to strike. Take half matured side-shoots in January, 2 to 3 inches long with a slight heel of the older wood and insert in pots of sand, covered with a bell jar or wide-mouthed jam jar. They form roots in about six weeks and then can be potted separately to grow on to planting-out size.

There should be some prospects for growing feijoas commercially in Victoria to provide winter fruit. They are grown for this purpose in France, U.S.A., and in New Zealand. They appear to do well wherever lemons can be grown and, indeed, they are less subject to frost.



Fruit as dropped from bush. These are only partly mature. Keep until soft. when the centre is completely jelly-like and ready for use.

The Purple Guava, Psidium Cattleianum.

This species is about the only true guava species that can be grown in our climate with any degree of certainty as it is hardier than others. Plants of this species are readily obtainable from local nurseries. While it is a near relative of the feijoa, the Purple Guava is much slower in growth and its flowers are not so attractive, its main ornamental attraction being its foliage. Like the feijoa, it ripens its fruits late in the season and its main use is for making guava jelly, which is considered to be the finest of all fruit jellies. It has an attractive strawberry-like flavour when fresh, and this is the reason for its common name, Strawberry Guava, but its many hard seeds are a disadvantage for dessert purposes, and in the south they rarely reach the full maturity necessary for this use. For jelly, the fruits are better picked slightly before full maturity.

The Cumquat.

Mention has been made of the possible use of the commoner species of citrus as ornamental subjects but cumquats are seldom planted in the fruit garden. On the other hand, their compact growth and bright evergreen leaves together with the multitude of small orange-like fruits make them very decorative. They are sometimes grown as tub plants, clipped to a formal shape and perhaps placed in pairs at an entrance or along a terrace. The fruits remain for a considerable period after colouring and they make one of the most attractive marmalades either separately or in combination with some other citrus fruit. Crystallized cumquats are also one of the best of such fruits. In all other respects, they are given the same treatment as other citrus trees in regard to pest control and feeding. Cumquats will grow anywhere where lemons can be grown.

The Eugenias.

The fruits of most of this family are quite edible but not always attractive except when cooked or made into jam. For the latter purpose, the fruits of our own Lilly-pilly, *Eugenia Smithii*, have often been used but the most attractive fruits to be eaten raw are those of the *Eugenia ugni*, a Chilian species obtainable here. It is quite dwarf, growing only to 2 or 3 feet, having fuchsia-like white flowers followed by rose-coloured berries.

Arbutus Unedo, the Irish Strawberry.

If this species is grown in cool districts, it produces fleshy fruits which are quite suitable for jam making, but in the warmer districts they are generally rather too woody for this use.

Olives.

One or two olives are worth including in a large garden on account of their foliage no less than for their fruits. They are particularly suitable for the hotter and dry districts but even as far south as Melbourne, their fruits will mature sufficiently for use as pickled olives and in favourable seasons they will ripen.

The Queensland or Popple Nut, Macadamia ternifolia.

This species is generally considered to produce the finest nuts of all, their only disadvantage being that they are hard to crack. The trees are quite decorative and worthwhile as an ornamental. Macadamias can be grown successfully where lemons can be grown but grow quicker and are more productive in summer rainfall areas such as in East Gippsland. In Victoria, they seldom produce nuts until about their seventh year but afterwards are generally productive if plenty of moisture is supplied in dry times.

THE SWEET BAY, LAURUS NOBILIS:

Most housewives would appreciate a plant of this species in their garden as so many recipes call for bay leaves as a flavouring. Bay leaves were, and still are, used as a flavouring instead of vanilla in custards, &c., and their use in stews, soups, sauces, and pickles is even more common. Bays become quite large trees in time but they can be kept to any height by clipping. Perhaps the best way of growing them in small gardens is to plant in tubs. Clipped specimens are one of the best subjects for this form of culture.

In next month's notes, some dual purpose deciduous trees and shrubs will be reviewed.

THE VEGETABLE GARDEN

Sowing Early Crops of Peas

The appearance of casual self-sown plants of peas at this time often suggests to home gardeners that they might sow an early crop in June. Subject to certain conditions, this can be done in the northern districts of this State with a good chance of success but south of the divide, except perhaps on the warmer coastal sands, the risk is too great even under garden conditions. There, sowings are best deferred until late July, or even later, in the colder inland areas. When considering any early sowings of peas, growers should appreciate the risks involved and try and select times when certain weather factors are not so likely to be a disadvantage.

Damage by frost is least likely as peas are frost-hardy except for a few days after they burst through the ground, and again, when they are about to flower or pod. The main trouble is too wet conditions especially if this is accompanied by dull and cold spells.

At any time of the year, peas should never be sown in soaked soil nor should the seed be soaked before sowing. Germinating pea seed is very susceptible to rot at the stage before the first shoots appear through the ground and some foliage is formed. Past this stage, they will tolerate wetter soil conditions though a prolonged water-logging is fatal at any stage or at any time of the year.

Anyone sowing early pea crops should choose a very well drained bed and for this sowing, make sure that they will get the maximum amount of the limited winter sunshine. It is the greater amount of winter sunshine and consequent day temperatures, coupled with the usually well drained sandy soils that allow early commercial crops to flourish in our northern areas, in spite of the fact that there, frost may be just as frequent and often heavier than in many southern areas.

In gardens, it is as well to sow after a period of little or no rain with the soil as dry as possible. If the soil is soaked just before sowing and rains come immediately after, the seed is almost certain to rot. The seed is best sown on ridges to allow a surface run-off if heavy rains occur. Being deep-rooting right from the germination stage, peas will grow with a minimum of moisture during the cooler weather. Dusting the seed with a special legume dust, though not a perfect protection against excessive wet conditions, does seem to allow dusted seed to survive rather wetter conditions than untreated seed.

The other major trouble with winter-sown peas is attack by mildew caused by excessive atmospheric humidity from night fogs and dews preceding dull days without sunshine. Mildew attack at any time is helped by lack of air circulation round the plants and for both reasons, therefore, an open situation that is not shaded from sun or wind is preferable for winter and early-sown crops. The provision of support for the growing plants, which is desirable at any time to promote prolific podding, also helps to prevent mildew developing and, if a mild attack does occur, it is easier to control by the usual sulphur dusts or sprays.

Journal of the Department of Agriculture

VICTORIA

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Agricultural Information and the Man on the Land

An address given by Mr. H. A. Mullett, I.S.O., B.Agr.Sc., Director of Agriculture, at the 48th Annual Convention of the Chamber of Agriculture held at Bairnsdale on April 21, 1953.

IN every enlightened country in the world there are organized governmental agricultural advisory services and these are looked on as essential to raising the efficiency of production in the interests of the State.

In Victoria, where the annual value of primary production is now of the order of £286 millions, and where primary produce constitutes 90 per cent. of the total value of our exports, it is obvious that the stake is so large that ordinary business prudence requires that all reasonable steps should be taken to constantly improve the efficiency of production.

Mr. H. A. MULLETT, I.S.O., B.Agr.Sc.,
Director of Agriculture.

In every walk of life, men vary in their efficiency and this is as true of the farming community as it is of any other section. This variability in farming efficiency has been the subject of intensive study in many parts of the world, especially in the United States. In Australia some intensive studies have been made by the Bureau of Agricultural Economics, and a few by the School of Agriculture, University of Melbourne. The method is to study, say, a group of 100 farms in like districts, and compare the returns from the various properties and analyse the factors responsible. Everywhere these surveys are conducted, considerable variations in the cost of production of the various commodities are noticed, and on investigation these are shown to reflect the efficiency of the management.

Of course, many things are responsible for this uneven result including the inherent variability in human beings themselves as well as social and economic factors, but sheer want of accurate and up-to-date knowledge is responsible in many cases. Where failure to obtain maximum efficiency is due to want of knowledge, then we can, and should, do something about it. This is the primary objective of an efficient agricultural extension service. It is axiomatic that such a service should have accurate knowledge of how to increase the yields of plants and animals, and how to prevent loss of production due to disease, and it must understand how to maintain and increase soil fertility and prevent erosion.

It is not sufficient for the extension worker merely to submit this or that method of improving crop production to the man

on the land and let it go at that. He should be in a position to discuss its practical application in a much more telling way, and he can do that if he knows the effect on the farm income from a study of farm survey data. He should know which farms are most profitable and those that are least profitable, and why. Then he is in a position to select the farms that need special attention, and to know the kind of attention they need.

The Department of Agriculture has a comprehensive research and investigation programme into all forms of primary production, but it still lacks the special farm survey section necessary to get business data on farm costs, and is compelled to rely on other sources of information so far as they are available. Because of this, in my opinion, our advisory services are not so effective as they should be. This is a weakness, but so far I have been unable to remedy it. However, signs are not wanting that at last it will be possible to go ahead.

The extension worker must understand the art of arousing the interest of the farmer, and then holding his attention. To do that he must understand both his problems and his psychology.

These then are the basic principles employed by all extension organizations, but they are deceptively simple. It is apparently a subject upon which almost anyone having contact with agriculture feels competent to " advise the advisers ".

DISTRICT AGRICULTURAL OFFICERS

Some special studies have been made by the Australian Institute of Agricultural Science and other groups, and schemes for re-organizing the advisory services throughout Australia have been put forward. Most of them attach great importance to setting up district agricultural advisers with university qualifications in each of the principal districts to act as district leaders. With this policy I am in entire agreement. In fact, I can fairly claim to have led the way in advocating and adopting this method, but I would point out that it has proved to be extremely difficult to recruit to the Department an adequate number of men for the work.

After years of effort we now have a District Agricultural Extension Branch. As yet, it consists of only six officers—two less than it contained a few years ago, but a full staff, in my opinion, would require more like 26. In the Department we firmly believe in this policy. Then, you might well ask, why do we not get the men? This is a question I have pondered long and deeply, and I am bound to admit that for many years the salaries that we were permitted to pay agricultural graduates in any section of our work were not attractive. This is the principal reason why, over the years, we lost a number of men who would have made first class District Advisory Officers, and, no doubt, why we did not attract sufficient numbers for any of our work. In recent years, however, the salary levels have been adjusted substantially upward and now compare not unfavourably with those outside the service.

The conclusion I reach is that, in recent years, young graduates in agricultural science as a class are not deeply interested in this kind of work. If there are any, then business firms get them. This year we advertised three positions for graduates in their first year out of the university, for special training in agricultural extension work. The salary scale was £886 to £1,172. It was also intimated that the men would then be eligible for promotion to Class " B "—£1,207–£1,285. We had only one person inquire and he did not go on with it.

If, to some graduates, such a career is not really unattractive it may well be that they are not prepared to undertake the apprenticeship we regard as necessary to equip them to successfully lead farmers in their districts.

No factory with practical problems would engage a trained scientist to solve them by a process of giving advice consisting solely of broad principles, and that method of approach, while of general educational value, won't solve the farmers practical problems either. They have practical problems and they want practical solutions.

It is necessary to have an adequate body of sound, proved, teachable facts to place at the disposal of advisory officers. Young graduates cannot acquire this information until they know and understand thoroughly the facts at the disposal of the Department, nor can they act as effective liaison officers between the farmers and the Department until they understand the departmental organization and its capacity to provide

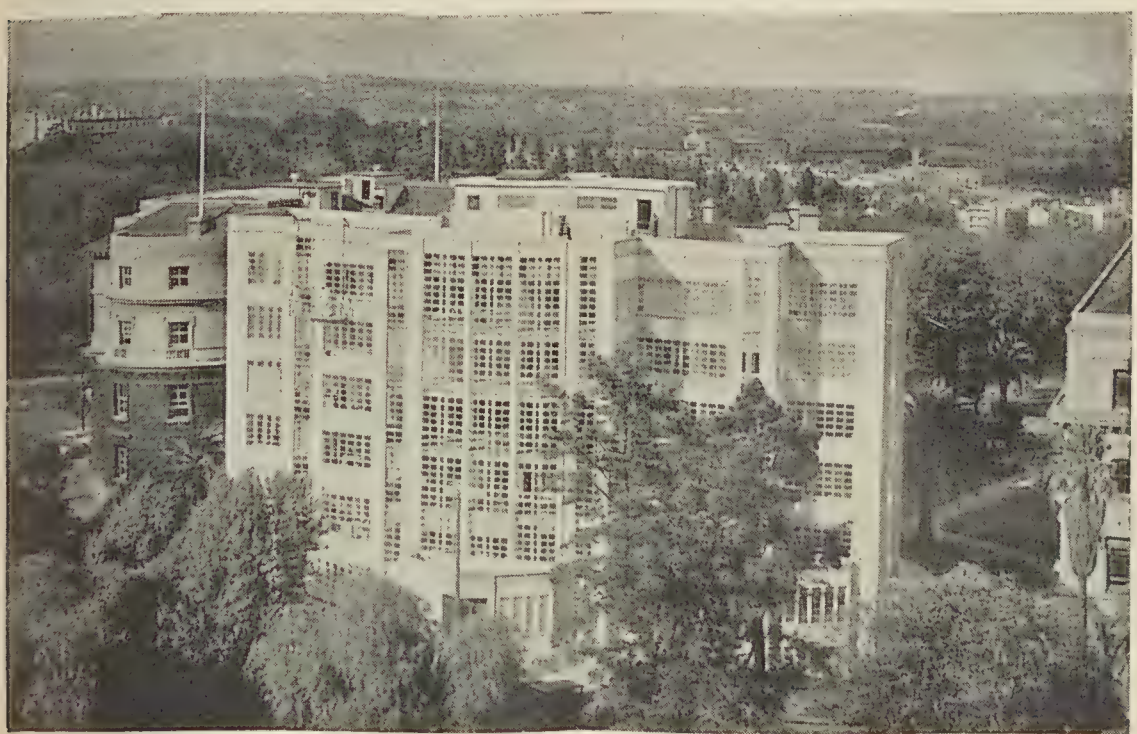
the answer to the farmers' problems, as well as the kind of problems that have to be solved.

The air and even the press these days are full of scientific propaganda, even propaganda boosting scientific organizations. I do not deny that this has its place and its uses, but in much of this there is no basic teachable fact that, if put into practice, will lift production, say, on your farm. All of it is interesting enough and often thought-stimulating, but when you analyse it, to get at the facts for direct application to improve production, you find it does not tell you what to do to grow more wheat; what to do on your farm to grow more grass, or how to increase the production of this crop or of that animal. When you apply these tests, propaganda of this type is generally seen to be accounts of exciting research work in progress which it is hoped to successfully conclude in the future, or interesting accounts of what is being done in some industry other than yours, or what they do when they grow your crop in some other country, and so on. This, no doubt, is legitimate and useful work for various people outside the Department, but it is, so to speak, a scientific apéritif, that is to say, something that whets the appetite but does not satisfy hunger for facts. However, somebody must do the work of bringing to the farmer the information that will directly increase production, and it must be the officers of the Department of Agriculture that fill the role in this State.

The acquisition of the necessary facts and point of view take some years of training. This is a process that does not appeal to many. In this age of specialization it may seem rather like being trained to be a "Jack of all trades" and, therefore, "master of none." This is really a superficial point of view. A successful extension worker is really a most skilled professional officer.

As a career, extension work has not yet anywhere in Australia received the recognition that is its due and which it ultimately is bound to receive. In the U.S.A. specialist extension workers range in salary and status with university professors, and county agents are only a grade in pay lower.

This is a cynical and materialistic age, and it is bound to some extent to mould the point of view of impressionable young men. For first class extension workers we need men with a dash of that old-fashioned



Headquarters of the Victorian Department of Agriculture, Parliament Place, Melbourne.

evangelistic zeal which finds great satisfaction in a career devoted to inspiring others to more enlightened effort. We need the kind who possess the necessary optimism in their make-up to confidently believe that their pioneering efforts in agricultural extension work will so appeal to the community that their own ultimate financial status will match the importance of the work, and that they will also be rewarded by seeing around them tangible evidence of the good they have done for their fellow men.

I have devoted some time to this aspect of agricultural extension work because I believe that this is the path we must follow in order to make the next big step forward, and so that you will understand the problem.

EXTENSION SERVICES

With full-time district extension officers so difficult to acquire we have had to develop our extension services by other means. We have 375 officers in the Department who engage full-time or part-time in extension work. They include graduates in agricultural science, in science, in veterinary science, officers with the diploma of an agricultural college, and officers whose qualification is a sound practical farm experience plus passing a qualifying examination. They include 35 full-time extension specialist officers with graduate and diploma qualifications. We have not the same trouble in recruiting young agricultural graduates for training for these positions or for that matter those who undertake part-time extension work, because most of these begin as research workers in the field, and many continue to be engaged in it and conduct extension work as well.

A specialist extension officer who makes that his career is fairly certain to acquire a public recognition of his expert knowledge. This gives him a certain personal satisfaction which is a natural stimulus to good work.

Those graduates who engage partly in research and partly in extension work, or even partly in administration and partly in extension work, are meeting the needs of the current situation.

The functioning of a district extension service involves the necessary and delicate process of the specialist extension officers, whether full-time or part-time in that regard, training the district extension officers in the field and keeping them posted with developments. Human nature is such that it is not every specialist who is at once filled with zeal when it comes to sharing his skill with one who may seem to be a possible rival in public esteem, but once they overcome their initial reluctance, specialist officers find that they increase in stature for they learn at least as much as they teach.

The number of officers engaged part-time in extension work is 315. They comprise 45 in the Agricultural Division of the Department, 60 in the Horticultural Division, 136 in the Dairying Division, 56 in the Live Stock Division, 13 in the Biology Branch, and 5 in the Information Branch.

We estimate the work performed by these men to be equal to 100 officers on full time, so that the total number of qualified officers engaged full-time on extension approximates 135.

To-day, fourteen veterinary officers, 22 stock inspectors, 21 orchard supervisors

Annual field days at the Department's research stations are a feature of the extension services.

Departmental officer discusses fruit-growing problems with growers at Tatura Horticultural Research Station.

and 83 dairy supervisors are located permanently in country districts. These officers are constantly in touch with farmers, visiting their properties, and they constitute an important extension potential which is in the process of development.

Horticulture Services

The Horticultural Division pioneered this method of extension in the Department. The 21 orchard supervisors in the country are the principal extension medium. They are the men who have the day-to-day contact with the 6,000 fruit growers and they are the men through whom the specialist officers in that Division mainly achieve contact with the growers. They are engaged full-time on extension work.

It is common knowledge that the standard of efficiency in the horticultural industries is high, and the speed with which the fruit industry has tackled the problem of reworking varieties, of drainage, the use of the newer pesticides and fungicides, acted on spraying programmes based on scientifically-timed observations in the field, employed plant hormones which control the number of blossoms set on trees and the holding of mature fruit on the trees; the way in which they have learnt to improve the efficiency of fertilizers used by observation of leaf symptoms, achieved improvements in their fruit pack and cool storage methods based on departmental research, show at once a progressive spirit in the growers and an efficient research service in the Department.

The number of demonstration and experimental plots being conducted on private farms of the main horticultural crops is 123. Last year the Division held seven field days. One thousand growers were posted special pest control advice as necessary throughout the season and 6,000 circulars were distributed last year. This is repeated each year with revised information. Some 100 wireless talks and wireless warnings were given last year as well as 50 evening lectures to growers' organizations.

A special school of instruction at the rural training centre at Dookie Agricultural College, of three weeks' duration, was organized for fruit growers.

The fruit preserving branch of the Division gave 61 lectures last year, exhibits were staged at seven shows, and a number of apple-packing competitions for school children arranged.

I have gone into the activity of this Division in some detail to give you an adequate picture of the nature of the extension work we undertake in one industry and to show what can be achieved when the services of the officers already in the field are effectively utilized in extension work.

Two Departmental mobile film units operate continually in Victorian country districts.

Other Extension Activities

We are now in the process of endeavouring to step up the extension efficiency of 83 country dairy supervisors. Groups of these officers are being instructed by the departmental agrostologists in the work of that branch and its results, so that the main pasture facts for each district will be known to the supervisors and understood.

We propose to provide specialist extension veterinary officers so that the district veterinary officers can be kept fully informed of the latest developments in veterinary medicine and in animal husbandry.

During the past four years we have been enabled greatly to stimulate the extension work of our Dairying Division by the addition of two graduates in agricultural science who are deeply interested in dairy science, and by the maturing of our scholarship scheme under which promising Victorian agricultural students proceed to Massey Dairy College in New Zealand and acquire their degree over there.

Apart from this we are being greatly assisted by the Dairy Efficiency Grant to the States provided by the Commonwealth. Our share of this is £67,000 per annum. This has enabled us to greatly extend herd testing in this State and to improve its efficiency. The number of cows under test has been expanded from 64,000 in 1945–46 to 150,000 this year. This figure is greater than the combined totals of all the other States. A special mobile film unit for dairying has been set up as well as a dairy mobile science unit. State-wide dairy farm competitions have been initiated and special motion pictures on dairying prepared. Demonstrations on farms of the economics of the use of concentrates in feeding for production were undertaken.

During the year 38 field days, at which the dairy mobile unit was present, were held, and it visited nine schools. A number of demonstrations of silage making with the buck rake was given. Some 262 meetings and filmings were attended by the herd test officers, and many radio talks and press articles prepared. This grant has enabled us to supply our Dairying Division and our motion picture unit with some splendid mechanical aids to its extension service.

It would be tedious for you to have me catalogue, Division by Division, item by item, the nature of the extension activities of each. Suffice it to say that we utilize every known medium to arouse the interest of the man on the land and to convey our message to him. We use the press and the radio extensively. We publish 260,000 agricultural Journals each year, 140,000 technical bulletins, and distribute 130,000 free pamphlets. We issue 600 copies of

our press bulletin weekly. We make our own motion picture sound films, and last year our mobile film units gave 400 film-shows to a total audience exceeding 30,000 country people. Our officers gave 150 wireless talks and provided hundreds of short snippets to country radio networks.

We believe that country demonstration plots are a form of extension that are most informative and convincing to the farmer—for seeing is believing. In all, this year, we are conducting 390 plots on private farms. All told we held 80 field days on Government and private farms. Competitions promoting a friendly rivalry between individuals and between districts are an excellent means of creating interest in better methods and getting these methods put into practice. We encourage them. Last year we judged 80 competitions including crop and fallow competitions, fodder conservation competitions, dairy farm and farm competitions, and fruit packing competitions; our officers gave 265 lectures on technical subjects to agricultural organizations.

Thousands of illustrated wall sheets, charts, and pamphlets on technical subjects have been distributed and more are to follow.

At Dookie College the State has purchased the Rural Training Centre from the Commonwealth and we now use this to conduct resident classes of agricultural instruction to adults. Last year 26 short courses in special agricultural subjects, lasting one to four weeks, were held. These were attended by nearly 1,000 persons. The courses given were in dairying and pig raising, sheep husbandry and wool classing, tractors and machinery, soil conservation, horticulture, and poultry farming. There were special classes for women and young farmers, also for officers of the Department of Agriculture and the Soil Conservation Authority.

Last year the Commonwealth made a grant to the States to enable them to increase the efficiency of the extension work in the export industries, other than dairying. Our share was £40,000. The uncertainty as to whether this grant was to continue for more than one year, and our inability to guarantee prospective appointees a reasonable term of employment, led to a drastic revision of our original projects, and delay. In the end we have not been able to employ any special personnel at all. We hope these disabilities will be removed.

We have recognized that, in the Department, despite all our efforts, there is a wealth of information which is slow in finding its way to the producer. This is because the officers engaged in research and extension work cannot devote the necessary time to this aspect. We had hoped to use the new Commonwealth grant to fill the press and the air with these facts. To do that we need trained agricultural journalists. To improve the get-up of our publications, our films, and our wall sheets, we need first class display artists, but we cannot employ them so far. However, we will do our best by other means for the time being. Radio time will be purchased and new films will be produced, the printing of new bulletins undertaken and additional cameras, projectors, and other equipment purchased.

Approval has been given in principle to the purchasing of a special mobile extension unit. This will consist primarily

Farmers' courses at Dookie Agricultural College have proved extremely popular and successful. The classes, above and left, are receiving practical instruction in the operation of modern farm machinery.

The Department's mobile dairy science unit, bringing up-to-date information on dairy-farming problems, is a focal point for discussion at gatherings of dairy farmers.

of two large marquees and the necessary truck, trailer, and exhibits. The unit will visit country districts and will be an additional means to launching special campaigns for increasing production.

Approval has been sought for the purchase of special equipment to conduct demonstrations into fodder conservation methods, especially in the making of silage and meadow hay, and also for a large number of pasture demonstrations and for the fabrication of models of all kinds for demonstration purposes.

It may be that you are already asking yourself does this work actually result in increased production? All I can say is that we have led the way in much of this work in Australia and that we have the most intensively farmed State in Australia, and that the improvement in its productive capacity and methods over the past twenty years has been remarkable.

The total value of agricultural production is topped by only one other State, nearly four times as large as Victoria. We produce more milk, more butter, more cheese, more condensed milk than any other State. We are the second largest producer of wool in Australia.

The value of our agricultural production per acre is higher than that of any other State. Last year each acre in Victoria raised produce worth £5 2s.—more than double the figure for our nearest rival, New South Wales.

We top-dress seven million acres of pastures annually, an area many times larger than that in any other State.

Over the past five years we have produced more meat than any State other than New South Wales, and over the same period we have produced more wheat than any State other than New South Wales. Ninety per cent. of our wheat acreage is sown to wheat bred by the Department and proved superior to the wheats replaced.

No doubt, we have some material advantages. We have a wide awake progressive rural community, and while it has not yet everywhere attained maximum efficiency, it has every right to be proud of its past achievements and be confident of its future capacity for development. The rate of that development depends in part on the efficiency of the extension service. I have already indicated the direction in which we are endeavouring to go. *Let us go forward together!*

Establishment and Improvement of a Dairy Herd

II.—PURCHASE AND USE OF A HERD SIRE

By T. N. EDEY, M.Agr.Sc., Assistant Supervisor of Herd Testing

During the early years of herd testing in Victoria, production figures were used primarily to cull low producers and to select the dams of replacement stock. Initially, this policy achieved a considerable increase in the average production of grade herds but, over the past fifteen years, its effect has been disappointing.

With a better understanding of the factors which govern the rate of improvement in dairy herds, it is now clear that culling alone has very definite limitations as a method of herd improvement, a much more important factor being the quality of the herd sire employed.

THE IMPORTANCE OF THE HERD SIRE

AN individual cow's inheritance comes equally from sire and dam but, because a bull can sire many daughters in a year, he can rapidly exert a profound influence on a herd. If used extensively, a bull may, in seven or eight years, genetically comprise half the herd, i.e., half the hereditary make-up of each cow may be derived from him. By contrast, a cow is unlikely to have more than three daughters in a lifetime and, therefore, cannot exert a great influence on the herd.

Since the future productive level of the herd is so dependent on the herd sire, it is sheer folly to be careless in selecting a bull. Sire selection was put in its right perspective by A. H. Ward, the noted herd-improvement authority, when he said, "You will spend five years milking the daughters of your herd sire. How long will you spend selecting him?" The task is worth much more time and thought than it usually receives.

High-class bulls are not easily found and, if the buyer is pressed for time and wants a bull ready for service, his field of choice may be very limited. He may be choosing from the season's "left-overs". The buyer who can plan his purchase well in advance is in a position to demand the best that the bull-breeder has to offer. Some far-sighted farmers select their herd sire before he is born, by obtaining the

Bulls should not be selected on show-ring performances. There is no evidence that the breed type of a bull gives any worthwhile indication of the likely production of his daughters.

The best measure of a bull's dairy merit is the performance of his daughters. This bull sired 28 daughters, which, under predominantly grassland feeding, averaged 412 lb. butterfat.

option of purchase on a calf sired by the breeder's best bull out of the highest-producing cow which drops a bull calf.

Factors to Consider in Bull Selection

In bull selection, varying degrees of emphasis have been placed on the butterfat backing of various ancestors and on the appearance of the bull or of his ancestors. In many cases, the emphasis has been misplaced, and the time is overdue for a review of methods of bull selection. Two main considerations are important :—

1. How much attention should be paid to appearance ?
2. How much emphasis should be placed on the production records of different ancestors ?

Appearance

Concerning appearance, there is no evidence that the breed type of a bull gives any worthwhile indication of the likely production of his daughters. Consequently, for a farmer interested only in milk or butterfat production, it is of no benefit to select a sire on his own show performances or those of his ancestors.

Nevertheless, a close inspection of the bull is essential to ensure that it is healthy, has sound legs and feet, a strong, normal jaw, and is entire. In addition, it is wise to inspect close female relatives to ensure that their udders are suitable for machine milking—not pendulous, and have good teat placement. A bull displaying an undershot jaw, or one whose close female relatives have pendulous udders with out-turned teats, may pass on these weaknesses to his daughters.

Production

Apart from the above-mentioned purely utility points of appearance, all possible emphasis should be placed on the production credentials of the bull.

The ideal is to buy a high-class proven bull—one whose daughters' production records indicate that he is better than average. However, a bull is at least five years old before his first daughters complete a lactation, and good proven sires are almost unprocurable. Consequently, the average farmer must buy a young bull on his pedigree. The commercial farmer should be interested only in a pedigree of production for, unless information is available concerning the production of the bull's ancestors, the pedigree becomes a meaningless series of names and numbers.

Greatest emphasis must be placed on the closest relatives. An eminently distinguished great grandparent is of no advantage if the bull's parents are failures. An animal inherits half its genetic material from each parent and each generation by which an ancestor is removed, halves its influence. If the farmer can obtain as herd sire the son of a good proven bull and a cow with high lifetime production, little is to be gained by looking further back in the pedigree, though it will be well worthwhile to check the production records of the young bull's sisters and half-sisters in the herd. One lactation of one sister gives as good an estimate of a bull's worth as one record of his dam.

The dam of the bull should have demonstrated her ability to calve regularly and produce at a reasonable level for at least three lactations. Practically any cow can be force-fed for high production in a single lactation. In Denmark recently, six cows which, under normal conditions, averaged 364 lb. butterfat in 365 days, were placed on very heavy feeding and four-times daily milking. They averaged 924 lb. butterfat in 365 days, indicating very clearly the great influence high-level feeding and management can exert on the yield of a dairy cow. Consequently, a single-production record is an unreliable indicator of a cow's transmitting ability.

A more accurate estimate can be obtained by demanding at least three records of the dam of a prospective herd sire, for it is less likely that a cow will receive exceptional treatment over three seasons, and the longer period will demonstrate to some degree her fertility and longevity.

Since environment can so profoundly influence production records, it is essential that the buyer visit the farm and assess the feeding and management conditions under which the records were compiled. This is so important that buyers should not do business with breeders who are not prepared to provide adequate production information and details of their feeding and management practices.

It is advantageous to buy a bull locally, for this will make it easier to visit the farm and assess the herd's production figures and the records of the young bull's relatives in relation to the rest of the herd.

The progeny of a sire or dam having an undershot jaw are likely to inherit this undesirable characteristic.

How to Use the Herd Sire

Even when all possible care is taken in choosing a bull, sire selection is still a gamble. Consequently, the wise farmer is unwilling to make extensive use of an unproven bull, no matter how good its pedigree. The ideal practice is to obtain from the young sire in his first season, sufficient daughters (usually ten) to furnish a reliable sire survey, and then to make sparing use of him until these first daughters come into production. This may be achieved in large herds by having several herd sires, in small herds by selling the bull with right of re-purchase or, in a few cases, by exchanging bulls with a co-operative neighbour.

In most cases, however, herd size is such that only one bull can be maintained, and the owner must use his bull freely. If the farmer has taken sufficient care in selection, he can do this with some measure of confidence, but he would still be well advised, where practicable, to limit as far as possible the number of replacements kept from the bull which is unproven. Having carefully selected a bull, it is most important that he be kept until proved on his daughters' records. Too many

Running the bull with the herd is detrimental to his fertility and will almost certainly shorten his useful life.

(continued on page 255.)

A New Type of Water Trough for Pigs

By G. C. GRIFFITHS, Pig Husbandry Adviser

WHERE large quantities of separated milk, buttermilk, or whey are fed to pigs, drinking water is not required to complete the diet but, if the ration consists of foodstuffs containing a low percentage of water, an ample supply of water is essential to enable the animals to utilize their food efficiently. Pigs are usually given water by mixing it with the food they eat, or by supplying it from a separate drinking vessel.

As daily water requirements vary according to the size of the animal, class of foodstuff fed, and seasonal temperatures, the provision of all the water with the food is not desirable. Either insufficient or too much water can be given if this is practised. To satisfy natural thirst and enable the pigs to cool their bodies during hot weather, large quantities of water are necessary during summer months. In winter, less water will be required.

To allow the animals to regulate their own intake of water, a separate drinking vessel is essential. Where a number of pigs are kept, much time and labour will be lost if water is carted to them. Wherever possible this should be conveyed by pipe-line and suitable arrangements made for its distribution. When run into open troughs, wastage of water occurs if, as frequently happens, pigs gain access to the trough and foul the supply. Time and labour can be reduced to a minimum when automatic drinkers are used. These require only occasional attention for maintenance and provide a clean and regular supply of water at all times.

Various Types of Drinking Devices

The following are some of the automatic drinking devices used in piggeries :—

(1) Drinking fountain, consisting of a metal basin from which the pig obtains a regulated supply of water. The pig, by nosing against a spoon-shaped lever connected to a valve, releases water into the bowl.

(2) Elevated trough set above floor level. To reach the water in the trough, the pig must stand with its feet on a narrow ledge.

(3) Trough on floor level, with only a small section open for the pig to obtain water.

(4) The "walled" elevated trough, described and illustrated in this article.

With the exception of the drinking fountain, each device mentioned is fitted with a ball-float valve. As the pig drinks and lowers the level in the drinking section, water is released as the ball-float lowers the valve and permits an inflow from the pipe-line.

THE WALLED ELEVATED TROUGH

A brick structure, the trough is built between two high parallel walls set 10 inches apart.

Pigs can drink only from either end, the height of walls preventing access to the water from over the top of the wall.

The trough is divided into two drinking sections with a central compartment enclosing the ball-float valve.

Pigs cannot interfere with the valve because two cross baffle walls effectively block off this central section.

Water is conveyed to each drinking basin through a $\frac{3}{4}$-in. pipe under the baffle wall. As the water is consumed, fresh water flows through the pipe from the ball-float chamber. In addition to the durability of the structure, the trough has other desirable features and was designed to eliminate most of the faults in other watering devices.

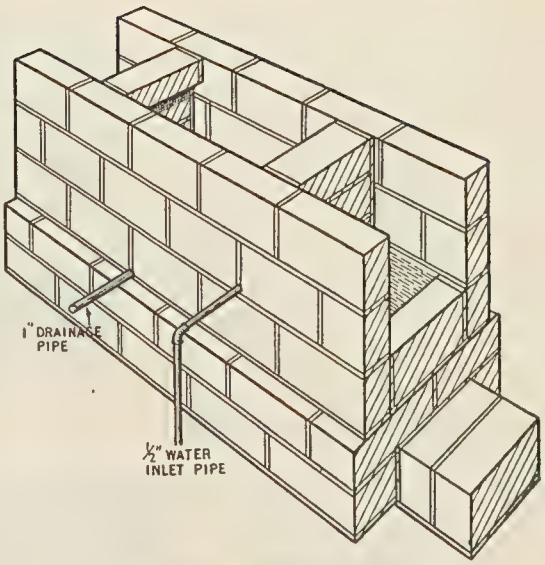
The prevention of waste is the most important of these features. To obtain a drink the pig must place its head between the two walls, therefore no splashing or standing in the trough is possible.

The trough will provide pigs of all ages and sizes with an equal opportunity to obtain water without effort or restriction. Young pigs use the step to reach the water, larger pigs reach the drinking bowl while standing on floor level. The water in the trough is shallow, and even the smallest pig finds it impossible to use the bowl as a bath. Despite the small volume of water in the trough, the temperature remains cool even on the hottest summer day.

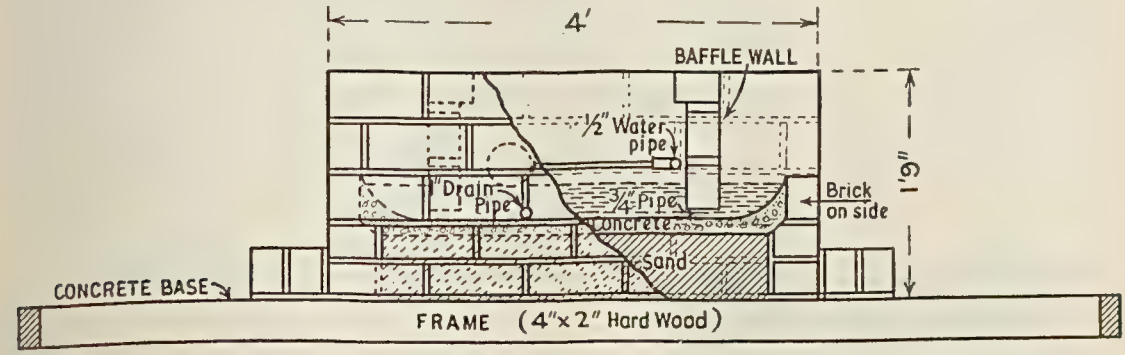
The trough may be constructed across a dividing fence and arranged to serve two pens or yards, or it may be used as a drinking unit in an open yard to supply a large number of pigs.

Construction of the Trough

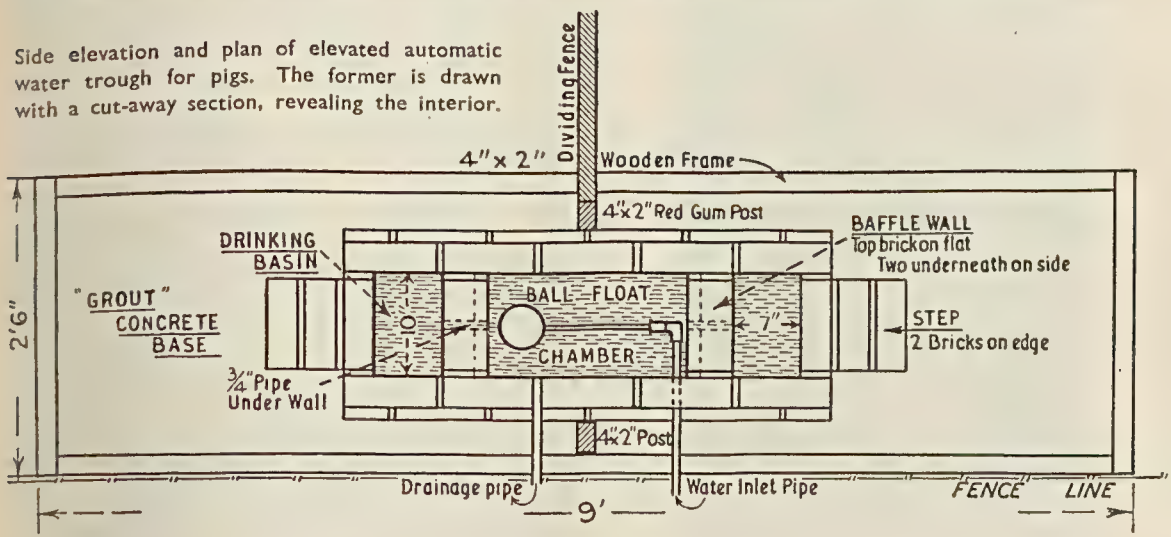
The accompanying photographs, together with plans and details of procedure, should enable any handyman to build similar troughs for installation in his piggery.



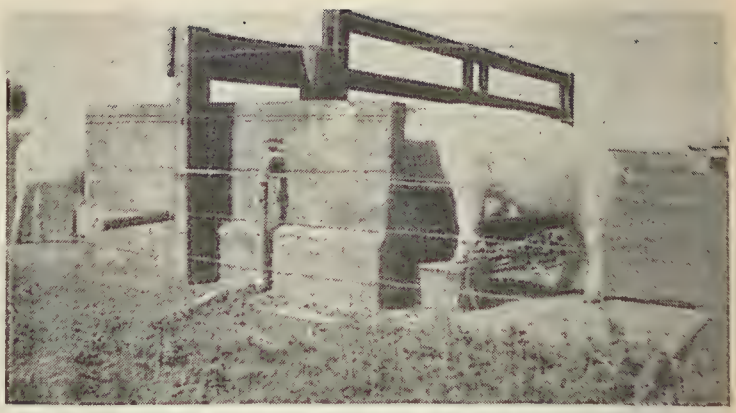
Perspective view of trough.



Side elevation and plan of elevated automatic water trough for pigs. The former is drawn with a cut-away section, revealing the interior.



If a concrete floor is not available as a foundation, it is advisable to construct one inside a wooden frame (9 ft. x 2 ft. 6 in.) on the selected site. By breaking up stone and other rubble to completely fill the inside of the frame and grouting in a semi-liquid mixture of sand and cement, a satisfactory base is constructed with very little sand and cement. The surface of the base may be levelled with a board while the cement is wet, then allowed to set.



The photograph illustrates how the pigs drink from each end of the trough. It shows also the dividing fence, drainage and water pipes.

If the trough is to be erected across a fence line to provide drinking facilities in two separate yards or pens, two 4-in. x 2-in. redgum posts should be set in position, one on either side of where the trough is to be built before the cement is poured.

When the cement is firm, the erection of the brick trough may be commenced. Two parallel lines of bricks are laid on a cement mortar. These rows, 10 inches apart, are 4 feet long and occupy the central portion of the base. The rows each comprise five bricks laid end to end with one brick placed lengthwise between the rows at each end to complete a hollow rectangle.

End view of trough showing drinking step, drinking basin and two baffle walls (Division fence removed).

The second course is commenced by bonding on to the first layer two bricks lengthwise across the end then four bricks along each side. The hollow between the now completed walls is filled with wet sand and consolidated to within approximately 1 inch of the top.

Cement mortar is placed on top of this sand and finished off level with the top of the bricks. The walls of the trough section are commenced by laying five bricks end to end along each side on top of this base. These bricks are laid on their sides and, with one brick placed lengthwise at each end between the rows, this forms the base of the perpendicular walls. The walls must be not less than 10 inches apart. When cementing the bricks of this course together, a 1-ft. length of 1-in. diameter piping is placed between the second and third brick on what is to be the outside row. This pipe later provides for draining the water from the trough when cleaning becomes necessary.

The side walls are now continued by adding two additional courses, each brick being laid on its side. On the same side as the drainage pipe in the second course, a gap is left between two of the whole bricks to permit entrance of the water pipe. Two baffles are now erected between the walls approximately 10 inches in from each end of the trough.

A short length of $\frac{3}{4}$-in. pipe is placed on mortar underneath the first brick to be laid and cemented in position. The next brick is also placed on its side on top of the base brick, while the third and last brick is laid on the flat to finish flush with the top of the two outside walls.

Mortar is used to finish off the floor and interior walls of the ball-float chamber, also to shape each drinking section in the form of a basin. By rounding off corners and sloping the floor towards the draining outlet, the trough may be emptied quickly when cleaning is necessary.

The construction of a step at each end is accomplished by cementing together two bricks, laid on their sides, and bonding them in position opposite the drinking section.

When the cement has set, water may be laid on, ball-float fitted inside the central compartment and adjusted, and the trough put into service. Materials required for the construction of the base and trough include rubble, $4\frac{2}{3}$ cubic feet of sand, $1\frac{2}{3}$ cubic feet of cement, 66 standard-size bricks (9 in. x 4 in. x 3 in.), 23 feet of 4-in. x 2-in. hardwood, and two 4-ft. lengths of 4-in. x 2-in. redgum (used for posts). Approximately ten hours of labour will be required to prepare the site, construct the base, and complete the trough.

ESTABLISHMENT AND IMPROVEMENT OF A DAIRY HERD—(*continued from page 251*)

Hand-mating in a convenient service-pen is the recommended method of bull usage.

bulls have already been slaughtered when their daughters show the sire to have been of high quality.

Once the records of the bull's first eight or ten daughters are available, an assessment can be made of his ability. If he is lowering production, the sooner he and his worst daughters are culled the better but, if he is an improver, the bull should be used extensively for as long as possible. Given good management, there should be little decline in the fertility of a bull up to the age of about eight years, and good proven bulls should be persisted with even to the stage of giving only a few services per year. The useful life of a bull can be lengthened by the use of a service-pen and hand-mating. The practice of running the bull with the herd is detrimental to his fertility and shortens his useful life.

In small herds, prolonged, exclusive use of a herd sire would involve some in-breeding to the extent of mating a bull with his own daughters, and farmers should be prepared to do this with a good proven bull. The possible consequences of in-breeding will be discussed in more detail in a later article.

Provided the herd is not already in-bred to the proven herd sire, it would be sound practice to save a son of the old bull out of one of the herd's top-producing cows. This would help to solve the problem of searching for a new herd sire, and ensure the continued utilization of a proved line of stock.

SUMMARY

The herd sire is of paramount importance and may, within a few years, comprise half the herd. Considerable thought and time should be devoted to his selection.

Selection of young bulls should be based on production records of near ancestors, appearance being considered only in so far as it concerns utility.

A series of records should be demanded, close attention being paid to the conditions under which they were compiled. Buy only from a breeder who will provide the required production and management information.

Keep the bull until proven, using sparingly in the interim if practicable.

If the survey proves satisfactory, use the sire freely, even to the extent of in-breeding.

A further instalment of this series of articles, "The Establishment and Improvement of a Dairy Herd", will be published in a subsequent issue of the Journal. The first instalment appeared in our April, 1953 issue.

Francois Robert de Castella

FRANCOIS ROBERT DE CASTELLA died peacefully on May 12 in his 87th year. "Cas", as he was affectionately known to all his colleagues, was the son of Hubert de Castella, who came to Australia in 1852, bringing with him the traditions and knowledge of many generations of Swiss vignerons. St. Hubert's Vineyard, near Lilydale, Victoria, established in the 1860's, produced until late in the century some of Australia's most elegant wines.

Francois, born on January 16, 1867, absorbed the influences of this fine early environment. He was further educated at Xavier College, Melbourne, and at the College of Fribourg and the University of Lausanne in Switzerland. He gained experience in celebrated French vineyards and returned to Australia in 1886 at the age of nineteen to manage St. Hubert's.

On May 22, 1890, when twenty-three, he was first appointed temporarily as "Vine Expert" in the Victorian Department of Agriculture and published, in 1891, the "Handbook on Viticulture for Victoria." The Royal Commission on Vegetable Products said of the handbook at the time, "This work has been prepared by Mr. Francois de Castella . . . . who from training and education is specially qualified to compile from the evidence given by the witnesses, and from his own experience in this Colony, a manual which shall be of practical service to the vine growers of Victoria."

For some years, from 1892, he engaged in commercial wine production at Tongala and Dookie; but in 1907 he was appointed again as "Viticultural Expert" in the Department of Agriculture to serve as "Viticultural Commissioner in Europe and Africa", and went abroad principally to obtain information on the control of Phylloxera of vines—then ravaging our vineyards—by the use of resistant rootstocks. Practically all vines for the reconstitution of Phylloxerated areas have continued to this day to come from the Wahgunyah Nursery, which was established on his return to Victoria in 1908.

Francois Robert de Castella

His personal influence in the Australian wine industry was very great and his important technical contributions were far too numerous to mention. Although he retired from the position of viticulturist in the Department of Agriculture in 1936, Francois de Castella was, until recent times, a contributor to all important viticultural conferences. In recognition of his outstanding services to viticulture he was awarded the French Honour, "Officier du Merite Agricole."

There was never anyone quite like "Cas." He was the friend of all who knew him. To know him was an education. Mrs. de Castella died several years ago; but he is survived by three sons Rolet, Hubert, and Paul.

[FRANK M. READ.]

Garden Notes for July

By GEORGE HYAM, Horticultural Supervisor

THE FLOWER GARDEN

The walnut tree is ornamental, and provides excellent shelter for stock in areas with a well-distributed rainfall such as North-Eastern river valleys and Gippsland hill country.

USEFUL DECIDUOUS ORNAMENTALS

THE useful and ornamental evergreen shrubs and trees reviewed in last month's notes are most suitable in districts where lemon trees can be grown. However, although some species are not entirely confined to districts which are moist and cool, in general, it can be said that most deciduous trees—whether purely ornamental or dual purpose, are best adapted to such areas rather than those which have hot and dry summers as for instance, in lowland districts north of the Divide.

There are however some which can be grown wherever deciduous fruits flourish, and where there is irrigation or sufficient rainfall, this zone extends throughout this State. The main disadvantage in growing deciduous ornamental trees in the warmer districts is that there is a premature ripening of the leaves and much of the beauty of their autumn tints is lost, and the successive gradations of colour tints, which is spread over some weeks in cool areas, does not occur.

Apart from the ornamental or useful aspect of deciduous trees in cool areas, they do not cast shade in the sunless and wettest months of the year and this can be of great advantage in districts which have a high winter rainfall and where winter sunshine is precious.

The species reviewed hereunder are mainly trees useful for shade and shelter, selected from many other purely ornamental kinds as being capable of bearing some edible fruit or nuts even though they may be mainly planted for other purposes. All should be planted during the winter months.

Trees for Large Areas

Although slowly maturing, Walnut trees are handsome if they are given sufficient space to develop their natural habit, and in

suitable districts they provide considerable shade during the summer months for the house and for stock in paddocks. They can provide a substantial return though this is subject largely to seasonal conditions at pollination time and the seasonal incidence of black spot. Nevertheless, they are worthwhile as an ornamental even if the crop is a failure due to these conditions. Walnuts are not suitable for small gardens as a fully matured walnut tree can have a spread of over 40 feet under which, the shade becomes too dense for most other plants to flourish.

Walnuts are most suitable for hill districts with a deep friable soil which is well drained and does not dry out to any substantial depth in summer. As a shade tree which may produce some return, walnuts do not need any special attention but for commercial nut production, the soil and climatic conditions are much more important and there are other points to consider. Information on this subject is given in a free leaflet on Nut Culture available from this Department.

The Sweet or Spanish Chestnut (*Castanea sativa*) grows under similar conditions to those which walnuts favour and can be used for the same purposes. This species should not be confused with the Horse Chestnut (*Aesculus hippocastanum*), an entirely different genus but which is very similar in habit and foliage and is nut-bearing, although these are not edible as are the nuts of the Sweet Chestnut. Apart from their foliage horse chestnuts are mainly grown for their flowers, specially the red-flowering variety Rubra, which are much larger and more showy than those of the edible kind.

Either of these two species make an excellent avenue for a long drive to country properties in cool areas but they need a spacing of at least 60 feet. In common with other deciduous avenue trees, their bare limbs in winter allow the track between to dry out quickly where evergreens may keep the surface wet throughout this season.

In warmer and drier areas, Pecans—the Hickories, could be substituted for walnuts and they bear edible nuts resembling walnuts. Pecan trees are not easy to obtain in this State but some New South Wales nurseries might supply them or the trees could be started from nuts. They should be planted at the wide spacings given for walnuts.

Ornamentals for the Small Garden

Except in districts which have sunny weather and relative freedom from frosts during July or early August, Almonds are best regarded as ornamental trees for garden purposes although when conditions are favorable they will produce some nuts if planted in pairs of two appropriate varieties for cross pollination purposes. (See the leaflet mentioned above).

They are well worth planting for their blossom—they will flower satisfactorily in any part of the State except at high elevations—their grateful shade when left to grow their natural habit, and for a short period of autumn colouring later. Almonds can be recommended for providing shade over lawns for summer outdoor living and they make a good breakwind for a large garden in northern areas where they can be planted and grown on commercial lines for this purpose and for nut production.

The fruits of all the ornamental *flowering apples* can be used for jelly making and their ornamental flowers and foliage effects are well known. The best kinds for jelly-making are the florinunda varieties as these are nearest to the true crab-apples. These species can be grown anywhere where the ordinary fruit apples will grow and the tall-growing varieties can be trained to give good overhead shade when planted as specimen trees.

The single-flowered Ornamental Plums such as *Prunus Pissardi* will produce quantities of small plums closely resembling cherry-plums when they approach maturity though they seem to need cross-pollination with two kinds flowering at the same time to crop reasonably well. These fruits are quite suitable for stewing or for jam and they have the additional merit of maturing early in the season usually before the cherry-plums.

The Elderberries.—*Sambucus* species, bears edible black berries in clusters which also make good jam and the celebrated elderberry wine well-known to past generations. They only flourish in the cooler districts.

The Scotch Rowan.—*Sorbus aucuparia*, can be grown for its foliage effects in climates similar to Melbourne, but on the hills its red berries are much more succulent and when in this condition, they make an excellent chutney.

The Filberts.—*Corylus* species. These nuts are probably more ofter grown here as ornamentals on account of their autumn tints and catkins than for their nuts they produce or often fail to produce. In fairly cool localities there is little difficulty in producing reasonable crops provided that two varieties are planted for cross-pollination and the named varieties are just as ornamental as those sold purely for ornamental purposes. An example is the purple-leaved filbert which however, can be used as a pollinizer. As they are naturally shrubby in habit, they are best kept as a low shrub if only two specimens are planted but they also can be planted to advantage as hedges growing up to 6 feet or more, spacing them about 5 feet apart. The Cobb varieties are best for this. They flower late in spring so the catkins may fail to set in warm areas through excessive temperatures.

Persimmons and Pomegranites

Strictly speaking these are fruits seldom grown commercially, but in gardens they can well be considered as ornamentals principally on account of the decorative effect of their fruits, which will persist on the trees after the leaves have fallen, thus giving some colour in the winter. They can be grown almost anywhere in the State. The double-flowering dwarf pomegranite does not fruit.

THE VEGETABLE GARDEN

Growing Better Artichokes

The fact that Jerusalem artichokes grow so easily and in almost any odd corner of the garden usually tends to make gardeners rather careless in their cultivation of this vegetable and the result is sometimes a collection of knobby tubers of varying sizes and shapes which make them unpopular with the cook due to the work involved in preparing them. With a little extra trouble, larger and more symmetrical tubers can be produced and those which are planted and fed properly, and not grown from chance tubers left in the ground from the previous year, are also better flavoured and more attractive for the table.

As in the case of all vegetables grown from sets, such as potatoes, shallots and garlic, the sets of artichokes should be selected for size and shape. The best sets are those tubers which are not more than 1 to 1½ inches in diameter and which are plump without having too many protuberances. Larger tubers can be used if they are cut into pieces approximating this size, taking care that each section has two eyes or buds. July is the best time to plant and the buds are then plainly visible. As for potatoes, too many buds are a disadvantage as this tends to make the ensuing plants bear a number of undersized tubers.

So long as drainage is good, Jerusalem artichokes will grow in any soil, but if the soil is deeply dug and if plenty of compost or rotted manure is incorporated therein, the quality of the tubers will be much better both in regard to size, shape and eating quality. They are one of the few vegetables which seem to do equally well in the open or in fairly heavy shade.

The sets are best planted 4 inches deep in heavy soils and 6 inches in light sandy types and where a row is to be planted, space the sets 12 inches apart. Apart from their use as a vegetable, artichokes form a good breakwind for summer crops and are often planted with this end in view. They often grow to 10 feet in height.

One point that is not well known concerning artichokes is that the texture and quality in general are adversely affected if they are allowed to flower. The flower buds should be nipped out as soon as they appear.

The tubers can be lifted for use from about four weeks from this time or left in ground and used as required until after the tops die down in winter, but all the tubers should be lifted at the end of June and stored in sand otherwise they will shoot in July and make a mass of casual plants next season which will produce inferior tubers and may become a nuisance. When lifting at any time, this should be done with a fork as for potatoes and no tubers left behind.

Artichokes are not very popular with many people, probably due to the fact that they are sometimes treated like potatoes as a boiled or steamed vegetable. They are better baked or fried and of course, they are excellent for a vegetable soup. A good

cookery book will show several ways of serving them. They are easily peeled with the aid of a scrubbing brush and if immersed in cold water which has had a little vinegar added to it, they will remain white and the flavour is retained pending cooking.

Salsify—the Vegetable Oyster Plant

This root crop is becoming increasingly popular but home gardeners are not always successful in producing good-sized roots. This plant takes longer than any other root crop to mature, and early sowings are therefore desirable, and these should be started this month. From this sowing, they will be usable from December and can be left in the beds for use as required until the following August.

Good-sized roots up to 2 inches in diameter at the top can be grown if the soil is deeply dug and made very friable with compost worked into a narrow trench where the row is to be. Their long narrow seeds are best placed individually 1 inch deep, three to a site, at intervals of 9 inches, thinning out to one plant when 2 inches high. Although transplanting is sometimes recommended, the writer has always found that transplants produce only inferior roots. A reasonable quality root should be as symmetrical and tapered as a small parsnip.

Like artichokes, salsify often suffers through not being cooked properly. Apart from its merits for soup, it can be used in the same way as parsnips can, i.e., boiled, mashed, baked or fried, but the roots should be peeled. This is easily done if they are first par-boiled before the final cooking. The skin will then brush off easily.

As salsify is deep rooting and very tapered, the roots should always be lifted with a fork and not pulled.

Broad Beans for an Early Spring Crop

In most districts, July is quite a satisfactory time to sow broad beans and in many cases, these will be little, if any, behind March or April sown crops in maturing their pods. Broad beans are much more resistant to wet soil conditions than peas, though it is best to plant them under similar conditions for this winter sowing.

The seed-dusting treatment as for peas can be recommended. Dusted broad beans will usually come into bearing about a fortnight before undusted seed sown at the same time, apart from its protective value against rots.

Whether they are sown in the autumn or during the winter months, broad beans are frequently subject to bean rust or bean spot and it should be a routine job to give all broad bean plants a protective bordeaux spray at least once a month during the winter months. Later, from the end of July onwards, black bean aphis may occur and, if seen, promptly sprayed or dusted with D.D.T. or sprayed with a liquid B.H.C. compound. In the home garden, the combination general purpose dusts containing D.D.T., B.H.C., sulphur, and copper such as is used for tomatoes, &c., could be used instead of the above treatment against these problems.

The nipping-out of the top shoots of broad beans can be recommended. This is often stated to be necessary to cause the flowers to set properly but whether this actually does so is doubtful. However, the stopping of the first shoots by nipping out the growing points is good practice as it encourages the development of lateral shoots and, in any case, it is on these secondary shoots that most of the pods are formed and the restriction of their height may cause the lower flowers to set better. For good cropping, there is no need to allow the stems to grow more than about 3 ft. high and this restriction of height also makes the plants better able to stand up to wind.

Broad beans or peas are good crops to follow tomatoes or sweet corn in the garden crop rotation.

Rhubarb and Asparagus Beds

As the remaining last season's leaves of rhubarb plants die down, remove them but only when they are completely wilted. Some varieties may still have some succulent stems and leaves and these should be left.

June or July is a good time to apply feed to rhubarb and early feeding has some effect on early production particularly if a good mulch or organic manure is applied around and over the dormant crowns. But before applying this, give each clump a good double handful of a complete fertilizer like market gardener's or 2.2.1 but place this around and not over the crowns.

(continued on page 264.)

LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

CALF-FEEDING BAILS

CALF-FEEDING bails may be built and erected from hardwood timber or galvanized-iron piping, and the latter may be purchased from manufacturers and erected in position.

The following information should be useful when building calf-feeding bails from hardwood timber.

The double top and bottom rails illustrated in the diagram overleaf each comprise two 3-in. x 1-in. hardwood boards countersunk into the jarrah or other suitable 6-in. x 4-in. hardwood posts. The boards in each double rail are kept apart by the 2-in. x 2-in. bail partitions which are bolted between them every 15 inches by 5/16-in. bolts 5 inches long. The 2-in. x 1½-in. bail sticks have free movement between the two boards. Each bail stick is bolted at the bottom and may be pinned in three or four different positions along the top rail.

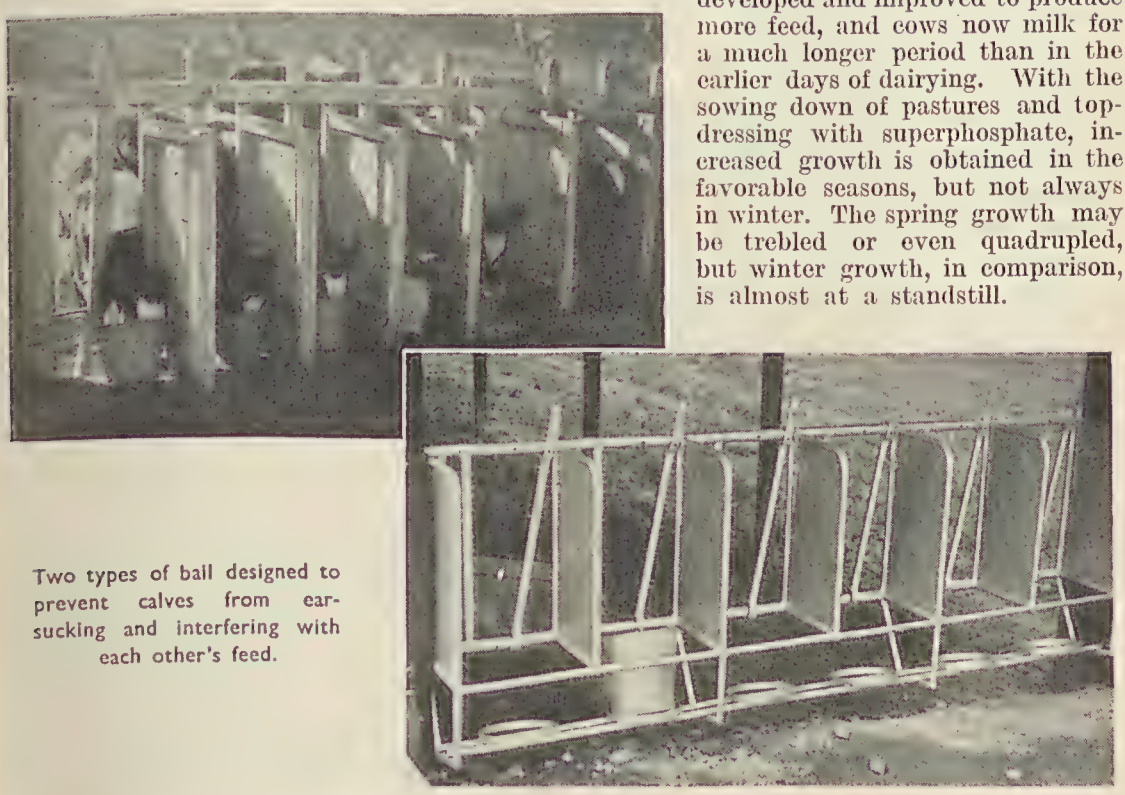
The quantity of material required for a 10 feet span of eight bails is as follows :—

Two 6-in. x 4-in. posts, each 5 ft. 6 in. long.
Four 3-in. x 1-in. rail boards, each 11 feet long.
Seven 2-in. x 2-in. bail partitions, each 2 ft. 10 in. long.
Eight 2-in. x 1½-in. bail sticks, each 3 ft. 4 in. long.
Twenty-six 5/16-in. bolts, each 5 in. long.
Eight 5/16-in. bail pins, each 6 inches long.

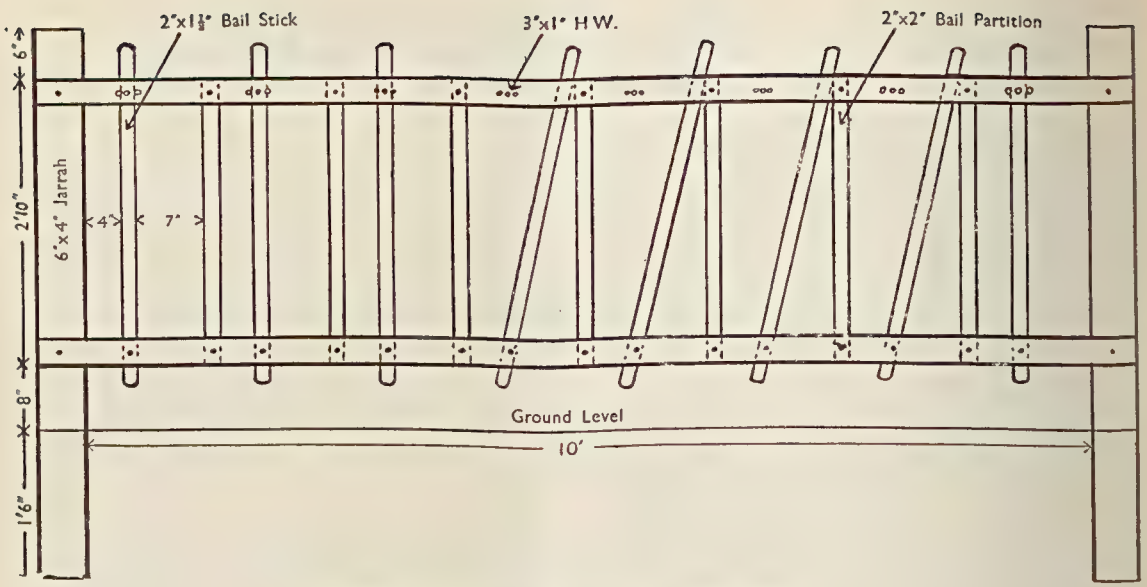
To prevent the calves from sucking the ears of their neighbours, solid partitions can be erected to protrude 9 inches to 12 inches in front of the bails between the animals' heads. These may be bracketed to the top and bottom rails and, for extra support, anchored to the ground or to a rail running parallel to, and 9 to 12 inches in front of, the bottom rail of the bail. This rail would assist in feeding operations, as the buckets cannot be butted over from the enclosure so formed. [A.C.T.H.]

FEEDING DAIRY COWS IN WINTER

Victorian pastures have been greatly developed and improved to produce more feed, and cows now milk for a much longer period than in the earlier days of dairying. With the sowing down of pastures and top-dressing with superphosphate, increased growth is obtained in the favorable seasons, but not always in winter. The spring growth may be trebled or even quadrupled, but winter growth, in comparison, is almost at a standstill.



Two types of bail designed to prevent calves from ear-sucking and interfering with each other's feed.



Calf-feeding bails to accommodate eight calves.

The dairy cow needs a constant and regular supply of feed. She needs about 60 lb. of green grass a day for maintenance, and another 30 lb. for each gallon of milk produced. On first class spring pasture she can graze 150 lb. in 24 hours, enough to produce 3 to 4 gallons of milk. On short pasture she will work hard to gather 40 lb. or less of green pasture, and this is insufficient to hold her condition without producing any milk. She will gather about half of this in the daytime and the other half at night. All cows need a good night paddock.

The extra nutrients to keep the cow in condition and produce milk must be supplied by the farmer, and for economical reasons should be provided largely from hay and silage conserved on the farm from the surplus spring growth. The nutrients in hay conserved on the farm cost the farmer under 1d. per pound, and most of this cost will be a charge against the normal farm labour and equipment and, therefore, not a direct cash payment from the farmer's account. On the other hand, at present prices, the nutrients in purchased fodders cost over 3d. per pound, and have to be paid for in cash.

Purchased fodders are recommended to make up for a deficiency of pasture and home-grown supplementary feed. Further particulars on the feeding of the dairy cow and other farm animals are set out in the pamphlet "Foods and Feeding", which is available free of charge on application to the Director, Department of Agriculture, Treasury Gardens, Melbourne, C.2.

[A.C.T.H.]

ORDER BOARS EARLY

Many farmers who buy new boars next spring may be disappointed because they cannot get boars of the age and quality they wanted. The reason is that boars are not the kind of article the seller can keep on hand indefinitely. If not sold for breeding purposes within a reasonable time, they are disposed of for slaughter, because too many mature boars on a farm are a nuisance.

Boar buyers would obtain better service and better value if they ordered or bought the boars they want a few months before they require them for service.

Many good boars are slaughtered before they reach serviceable age and so, at that age, the field of selection is small.

In the last few years, it has become common practice in Victoria to sell sows for slaughter as backfatters after they have had one, two, or three litters. That is in contrast to the old practice of keeping sows until they had produced six or seven litters. It is good practice to dispose of sows before they go into a decline as breeders. This is particularly profitable when the backfatter

market pays about 50 per cent. more for a big, fat sow than it costs to replace her in the herd with a young sow of bacon size and ready to mate. That has been the case in Victoria for some years past.

The quicker turn-over of sows, of course, makes it necessary to change boars frequently. That need not be unprofitable, because old boars decline in breeding value, but are still saleable for their meat.

[L. A. Downey, H.D.A., Pig Expert.]

DISINFECTION OF CHICKEN REARING EQUIPMENT

Young chickens are highly susceptible to disease and every effort should be made to protect them from infection, particularly during the early stages of growth.

Some breeders maintain that chickens, exposed to a mild concentration of disease organisms, develop a natural resistance to disease, but there is no actual evidence to support this theory. It is known that millions of chickens are successfully reared each year on clean, fresh litter, and therefore it would be unwise to adopt a system that involves many risks, rather than apply one that gives satisfactory results.

Brooder houses, brooding equipment, chicken houses, feeding and drinking utensils should be thoroughly cleaned and disinfected in preparation for the coming chicken season.

Outside runs and colony yards should have a good growth of grass. Repairs to fences, partitions, and wire floors should be well in hand. Ball taps and automatic drinking vessels should be checked for faulty washers, and pipelines tested for blockages, as any breakdown in the water supply during rearing can have serious effects. Drinking troughs should be examined for leakages, and all holes repaired. Metal troughs rust and deteriorate rapidly when out of use, and need attention immediately the chicken season is over.

Troughs will last much longer when given proper care. The best method is turn off the water supply and give the pipes a good blow through. Empty and clean the troughs, and give them a coat of hot tar. Allow two or three weeks to dry.

Replacement costs can be considerably reduced if care and attention are given to the various utensils when they are not in use.

Food and drinking troughs should be examined for sharp edges, as abrasions and cuts are the predisposing causes of oedemia of the wattle.

[M. D. Hall, Poultry Expert.]

BEEKEEPING

The Messmate Flow

During February and March, Messmate (*E. obliqua*) flowered most profusely. Masses of buds, hanging like bunches of grapes from healthy green foliage attracted apiarists to the areas bordered by Creswick, Trentham, Woodend, and Lancefield. This was probably the last hope for apiarists following a lean season and they migrated from as far afield as South Australia and some crossed the honeyless regions of central and northern Victoria from the Riverina.

Upwards of 30,000 colonies were located throughout this messmate area and one could find big apiaries up to 400 hives within a quarter of a mile of each other.

Generally bee strength was high and, at an estimated 50,000 bees per hive, the grand total would run into fifteen hundred million (1,500,000,000) bees.

The honey flow fluctuated; some days it was good, other days none came into the hives, causing bees in some places to rob badly.

From inspections of some 50 apiaries, and interviews with many apiarists, various explanations were given. Some claimed that nectar did not secrete heavily enough in the flowers. On close examination the Messmate trees were observed to be lasting in full flower for a few days and then browning off. A logical reason for this was that of overcrowding by bees.

Countless bees continuously rushing over the flowers in vain search for nectar, could have caused the flowers to brown quickly and fall off. Was nectar coming into the flowers at anything like the rate bees were visiting them? Compare this to a bargain sale, the early arrivals taking the best offering; the latecomers missing out.

Several isolated apiaries were observed to have netted the owners an average of 100 lb. of honey from each colony. This was a pointer to overcrowding elsewhere.

Even in areas literally swamped with bees, it was noticed that hives with well-bred young queens did better than their poorer-equipped neighbours.

Cold nights, and fewer flying hours, cut down the incoming flow and subsequent storing of honey. These factors combined with overcrowding, were probably responsible for the light crop. The amber-coloured messmate honey is a valuable food although not rated as a quality honey because of its color.

[A. M. Frost, Apiary Inspector.]

Don't Expect Too Much of Your Bees

Over-supering of hives is commonly practised by bee-keepers. Supers may be placed on hives in anticipation of a honey flow which does not materialize. In well-managed apiaries, however, they will be removed when it becomes apparent that they are not required. Instances have often occurred where full supers of comb-foundation have been placed over queen-excluders, on weak colonies, under poor conditions, when it has been impossible for such colonies to work over that amount of foundation or even occupy the super. Space requirement, and the amount of foundation which can be worked are determined by the strength of the colony, and the amount of nectar and pollen available coupled with weather conditions. Unoccupied space is often detrimental to the development and survival of the colony. During the winter it allows the escape of warmth from the cluster by forcing the bees to consume more of their winter stores to maintain the required temperature in the cluster. This may lead ultimately to the starvation of the colony. Also, combs outside the cluster absorb moisture and become mouldy. If they contain unsealed honey—which is often the case—this ferments and often contributes to "spring dwindle" of the bees.

During the spring it is necessary to provide space in the hive for expansion of the brood nest and cluster of bees, but if supers are added too soon, the extra space may retard brood expansion as at this time the bees are usually breeding to their utmost extent and the sudden empty space and subsequent escape of warmth may result in contraction of the cluster and chilling of outer patches of brood. Under favorable conditions a super of combs may be added to a single-deck hive in which the cluster fully covers about six combs.

The use of comb foundation in the spring will assist in swarm control, but should at all times be used with discretion. If placed in hives which are weak, or when there is a dearth of nectar and pollen, the bees will often gnaw holes in it. It will also buckle, and deteriorate generally. When conditions are favorable for its use, it is best alternated with drawn combs, or a single sheet placed on each side of the brood nest in the super. It is not advisable to place it against the wall of the hive or in the brood chamber.

It requires a strong colony on a heavy flow to draw a full super of foundation. If supers of combs are left on weak colonies during the summer months, the combs may be destroyed by wax moth, as weak colonies are unable to combat the pest.

Supers of combs may be placed upon strong colonies at intervals during the summer to prevent destruction by wax moth larvae. If supering for a heavy flow, consideration should be given to the strength of the colony as well as the quality of the flow.

Beekeepers will help their bees if they do not expect too much of them and give them space *as they require it*, and comb foundation *only if they can work it.*

[C. D. Ilton, Apiary Inspector.]

THE VEGETABLE GARDEN—(*continued from page 260*)

The fern of asparagus plants should now be cut down to about 2 inches from the surface so as to leave some stem to mark the position of each plant. If the plants were banked up for blanching sticks last season, break down the ridges. This is to allow the correct placement of manures and fertilizers which should be applied before early August when the banks are made up again. The flat beds should also be lightly forked over and left in the rough and asparagus beds growing by both methods should receive a dressing of agricultural lime at the rate of ½ lb. per sq. yd. The beds are then left until late July when the fertilizers are applied, but a liberal top-dressing of compost or other organic manure is better applied in June but not dug in until July when the beds are made up again. This helps to eliminate weeds.

THE DAIRY FARM

The Value of Concentrates

SCIENTISTS overseas have conducted many feeding experiments with various foodstuffs and from these have established tables showing the values of these feeds in terms of energy value and of protein-supplying value. They have also established standards for dairy cows of different sizes and at different levels of production, specifying average requirements of energy and protein units for body maintenance and for production.

But the feeding experiments were all carried out with stalled animals wholly hand-fed. When the figures are applied to cows which derive most of their food from pastures, any attempt to calculate a suitable ration can be regarded as only a rough approximation.

Economical High Production.

Nevertheless, such calculations can indicate the best way to adjust a ration in order to compensate for seasonal changes in the pasture. Such an adjustment may maintain a cow's flow of milk until the pastures again improve, whereas a failure to make good, say, a temporary lack of protein, could impair production for the rest of her lactation. Concentrates may have a place in adjustments of this kind.

But, should a farmer carry the use of concentrates further? Should he use them to stimulate his cows to even further effort? Or should he aim to increase the size of the herd he can carry by providing this additional feed? Feeding tables will not answer these questions. They are matters of farm economics rather than of food chemistry, and there may be a different answer for each farm. This was illustrated in a recent attempt to assess the amount of butterfat produced by the pastures on each acre of the farm of Mr. L. F. Nuttall, Yinnar, where a good deal of bought concentrate is fed.

This 76-acre farm carries 45 milking cows and all herd replacements. The herd average under test for the season was 461-lb butterfat, and the factory was actually supplied with 454-lb. butterfat per cow, which was equivalent to 269-lb butterfat per acre. The net cost of concentrate used was equal to the price received for 2,580-lb. butterfat, that is, the production of 5·7 cows of that herd, or 34-lb butterfat for each acre of the farm. Thus a yield of 235-lb. butterfat per acre or 397-lb butterfat per cow (at the factory) would have been required to produce the same monetary return without the use of concentrates.

Extra butterfat produced by feeding concentrates should more than pay for the concentrates if the practice is to be economical. This was not achieved on farms concerned in the feeding trials reported in the May issue of this Journal. In these trials the cows grazing on pasture, adequately supplemented with pasture hay, produced more economically than those whose rations also included concentrates.

Did the concentrates fed on Mr. Nuttall's farm yield a profit over their cost? In this instance—perhaps an exceptional one—they probably did. If not, then we must credit the pastures on the farm with a productivity of 235 lb. butterfat per acre, a figure much higher than that commonly encountered in the district on comparable farms where concentrates are not fed.

Some Special Features.

On the farm under discussion there is more than usual justification for considering the use of concentrates in any attempt made to increase total butterfat output. It is relatively small in area and the herd is easily handled by the labour available. Therefore, any increase in production gained by concentrate feeding will lower other costs, especially labour cost, per lb. of butterfat produced. Moreover, the breeding programme has produced a herd capable of responding to the extra feed by an increase in yield. Cows of lower quality may not respond sufficiently to pay the added cost of feed.

A point of interest in this case is that the owner relies on the concentrate, not so much to tide over periods when feed is less plentiful in the paddocks as to help the cows to give of their best when they are in full milk. This, again, could be economical only with cows of high inherent productivity.

This discussion, then, does not point to any conclusions as to the economic soundness or otherwise of feeding concentrates. It merely draws attention to some of the considerations which may affect the issue on a particular farm which is small in relation to the available labour and on which there is a herd of unusually high productivity.

In the report of the 1952 Dairy Farm Management Competition published in the March issue of the Journal, 170 lb. net butterfat per acre was wrongly attributed to Mr. Nuttall's farm instead of the figure given above—235 lb. per acre.

[K. M. Sillcock.]

What is a good Pedigree ?

A short pedigree, as shown in Figure 1, sets out which animals were the parents and grandparents of the bull calf in question.

- Bull Calf
  - Sire
    - Paternal Grandsire
    - Paternal Granddam
  - Dam
    - Maternal Grandsire
    - Maternal Granddam

Figure 1.

- Atlas Junior (Imp.) (Born 1.8.1952).
  - Atlas Senior.
    - Atlas Major
      1st prize St. George 1942. Son of Peppin Poppy. 589-lb fat. Exported to Canada.
    - Peppin Rose 8th H.C.
      Winner of many awards. 350-lb milk, 17·5-lb. fat, 7 days.

    Famous three-star Sire who won many championships, and whose daughters were rarely beaten in United Kingdom shows. Daughters' records up to 580-lb. He is by a son of Atlas Wonder, the famous Gold Medal Sire whose dam produced 850-lb. fat
  - Atlas Jenny
    - Besto Boy.
      Silver Medal Sire Daughters to 600-lb. fat.
    - Peppin Dream 14th H.C.
      Winner of championships in United Kingdom. Two H.C. daughters. 409-lb. fat in 305 days.

    2nd prize Derby Show 1948. Gold Medal 1950. 600-lb. fat, 365 days.

Figure 2.

Since all animals have two parents and four grandparents, the mere fact that a breeder can produce a pedigree giving the names of these ancestors, does not confer any particular merit on the bull calf unless those ancestors were known high producers. If full particulars are available concerning the productive worth of the parents and grandparents, little is to be gained by studying earlier generations. For each generation that an individual ancestor is removed its influence on the calf is halved. Thus, while the sire provides half the calf's inheritance, any one of the eight great grandparents provide only one-eighth.

Mere names in a pedigree are of little value, unless they are used as pegs on which to hang the production records of the cows concerned, and of the daughters of bulls involved. This is the information that will let the purchaser assess how good a calf is likely to be.

It is easy to "pad" a pedigree of a poorly-bred animal to make it look impressive to the unwary buyer by filling in pedigrees with selected information—the highest production records of the animal or its relatives, and various irrelevant details of show, production, or classification particulars of distant relatives in other countries. When only one record is quoted it is invariably the highest, and frequently, the same information is duplicated in successive generations.

Figure 2 provides a typical example of a well-padded pedigree.

In this pedigree the following points should be noted :—

(*a*) The selective nature of the production records.

(*b*) The repetition of Atlas Jenny's highest record under Besto Boy.

(*c*) The inclusion of short-term test records.

(*d*) The emphasis on show records.

(*e*) The prominence given to overseas awards, the significance of which are unknown.

(*f*) The reaching back three generations into Atlas Senior's pedigree to find a famous ancestor.

Tudor Junior
(Born 1.8.1952.)

Tudor Senior
Sire Survey :—
Fifteen daughters averaged 4·9 per cent. 370-lb. fat.
Fifteen dams averaged 4·8 per cent., 330-lb. fat

Tudor Major
Eight daughters averaged 320-lb. fat in all lactations.
Two sisters averaged 400-lb. fat in all lactations.

Laos Rose 8th H.C.
2 Yr. 260-lb., 273 days
3 yr. 340-lb., 273 days
4 yr. 400-lb., 273 days
6 yr. 380-lb., 273 days
7 yr. 420-lb. 273 days

Tudor Jenny 8th
2 yr. 300-lb. fat, 240 days
3 yr. 350-lb. fat, 273 days
4 yr. 460-lb. fat, 273 days
5 yr. 420-lb. fat, 273 days

Bronzewing Lad
Sire Survey :—
Fourteen daughters averaged 5·5 per cent., 390-lb. fat.
Fourteen dams averaged 5·2 per cent., 340-lb. fat

Laos Dream 4th
2 yr. 320-lb., 240 days
3 yr. 390-lb., 273 days
5 yr. 425-lb., 273 days
6 yr. 450-lb., 273 days

FIGURE 3.

(continued on page 270.)

HORTICULTURAL NOTES

Contributed by Officers of the Horticultural Division

Jobs for July

Spray apples and pears with dormant oil 5 in 100 for bryobia mite and woolly aphis; peaches and nectarines with tar distillate or D.N.C. 2½ in 100 for green peach aphis.

During pruning operations on stone fruits remove and destroy brown rot mummies and infected wood; while pruning vines, cut out as many black spot infected canes as can be spared. Always cut out badly infected canes.

Protect all large pruning wounds, and tree injuries caused by implements, with Bordeaux paste or bituminous paint.

Examine outfalls from underground drains to ensure that they are clear. Install extra underground drains where necessary.

Order fertilizer for spring application.

Citrus growers may find opportunity during this month to carry out some pruning.

Spray citrus with Bordeaux 6 : 6 : 100 plus ½ gallon white oil, in July or August, if weather conditions favour the development of bacterial and fungal diseases.

This heavy onion crop has been cured in the sun and is now ready for bagging.

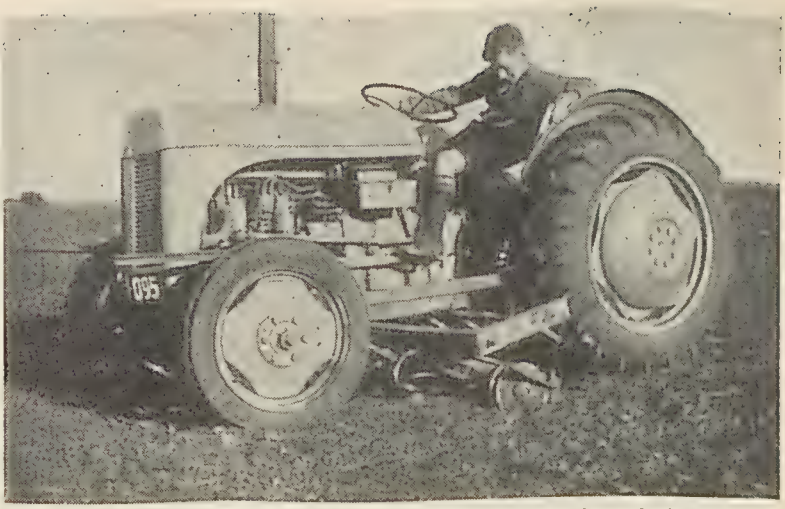
MECHANIZATION OF ONION PRODUCTION

WHEN Mr. Leo Crowe of Port Fairy produced a 10-ton onion crop recently he showed that, with the use of tractor cultivation and modern weedicides, hand-weeding of onions can be practically eliminated. Weed control sprays were applied before and after emergence of the onions, to more than half of a 10-acre block.

Mr. Crowe is a dairy farmer who became interested in tractor cultivation of onions after reading an article in the New Zealand Journal of Agriculture on onion production at Pukekohe, where production of onions is completely mechanized. Mr. Crowe sowed his crop with a five-row seeder mounted on the hydraulic lift of a Ferguson tractor, rows being spaced at 16 inches to allow for the passage of tractor wheels. A strip 2 inches wide along each row was sprayed with power kerosene just before the onions emerged from the soil. The tractor-mounted spray unit covered ten rows at a time. The spray nozzles were placed directly over the rows, close to the ground, the rate of application being 15 gallons of power kerosene per acre.

After the onion seedlings had emerged, weeds between the rows were controlled by a tractor-mounted cultivator (consisting

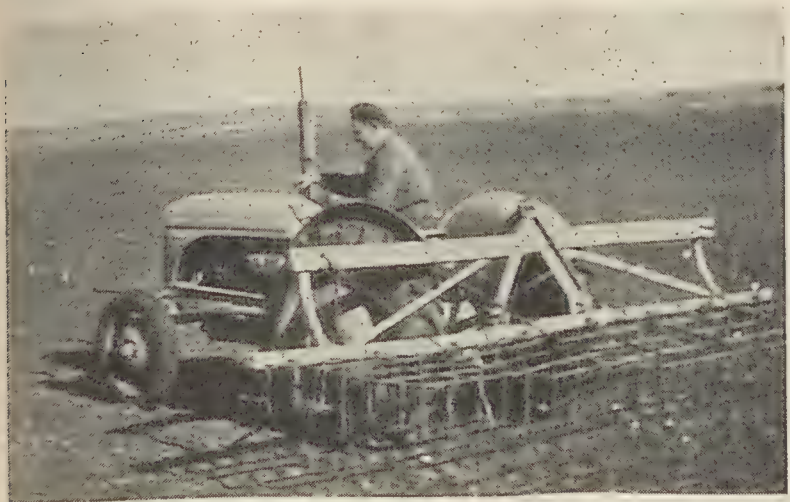
of discs and blade hoes) adapted from an old wheat-drill. Weeds in the onion rows were controlled by cross-harrowing with light spring-tyne harrows, mounted on the hydraulic lift, so that depth of harrowing was readily adjustable. Young onion plants recover quickly after tractor wheels have passed over them during this operation.



Tractor-mounted cultivator adapted from an old wheat drill, by Mr. L. Crowe, for cultivating between the onion rows.

When the onions were 4 to 6 inches high and too advanced for cross-harrowing, the weeds in the onion rows became a problem. Although selective chemical weed control trials being conducted by the Department of Agriculture had not been completed, sodium pentachlorophenate was showing promise as a post-emergence weed-killer for onions and Mr. Crowe decided to take a risk and use it. Sodium pentachlorophenate was applied as a 1 per cent. solution, i.e., 10 lb. to 100 gallons of water. The spray was applied from fan nozzles placed at 45° downwards from the horizontal and to the side of the onion rows; with the result that the weeds in the onion rows and the bases of the onions were sprayed, but the tips of the onion plants were not sprayed. Mr. Crowe found it necessary to hand weed after the chemical spray as the larger weeds were checked but not killed. In future he intends to spray when the weeds are still in the seedling stage which may mean three to four post-emergence sprays in a season, but hand-weeding will not be necessary.

This grower's success should make good reading for onion growers as the efficacy of mechanical and chemical weed control means that the expensive and arduous "crawling" of weeds can be eliminated. It is interesting to note that the increase in distance between rows from 9 to 16 inches did not cause any noticeable reduction in yield per acre.



Light spring-tyne harrows used by Mr. Crowe for cross-cultivating his onion crop. The harrows are mounted on the hydraulic lift of the tractor to enable depth of working to be readily adjusted.

NOTE:—Sodium pentachlorophenate is a non-poisonous powder, but is a nose-irritant and should be handled with care.

[R. O. Kefford, B.Agr.Sc., Horticultural Research Officer.]

UREA AS A VEGETABLE FERTILIZER

Many market gardeners in Victoria are now trying the nitrogenous fertilizer,

urea, on vegetable crops, and officers of the Department of Agriculture are also carrying out accurate tests with it.

The following information should be regarded only as a guide to those who, having heard or read reports on urea, might be keen to try it. The facts available to the Department from tests carried out by its own officers or by growers are not sufficient to enable it to make a statement on the full value of urea in the production of vegetables.

Urea (46 per cent. nitrogen) contains over twice as much nitrogen per lb. of fertilizer as sulphate of ammonia (20·6 per cent. nitrogen). Thus, although the cost of urea is more than twice that of sulphate of ammonia, the cost per unit of nitrogen is practically the same.

Like sulphate of ammonia, urea is a source of nitrogen only, and contains no other plant foods.

Thus it is being used for side-dressings to leaf crops such as lettuce, cabbage, celery, and Brussels sprouts in place of sulphate of ammonia, at about half the rate of application.

Urea is readily soluble in water and when sprayed on the leaves of crops is absorbed into the plant very rapidly.

Spraying with urea can cause a burning of the leaves, probably due to a temporary or permanent deficiency of potassium in the plant, as in the metropolitan vegetable growing districts applications of nitrogenous fertilizer are known to cause potassium deficiency. Therefore when urea is to be used as a spray or side-dressing, it is important to ensure that there is an adequate supply of other plant nutrients, particularly potash, in the base fertilizer dressing for the crop.

Preliminary trials with lettuce by the Department have shown that plants appear to become more sensitive to urea sprays as they approach maturity. Consequently, it is necessary to use weaker sprays as the crop progresses.

The following strengths appear to be the maximum which can safely be used on lettuce crops. A 4 per cent. spray (40 lb. urea in 100 gallons water) for seedlings, a 2 per cent. spray up to the hearting stage and a 1 per cent. spray beyond the hearting stage. There is a greater response to sprays and side-dressings of nitrogenous fertilizers in winter than in summer. Urea sprays may prove very useful for these winter applications of nitrogen.

It must again be stressed that the spray strengths suggested should be used as a guide only, as experiments with urea are not far enough advanced to make detailed recommendations possible.

[R. O. Kefford, B.Agr.Sc., Horticultural Research Officer.]

THE DAIRY FARM—(continued from page 267)

By contrast, the pedigree in Figure 3 contains bald factual information which would permit a good assessment of the likely breeding worth of the calf concerned.

Details of all available lactations are published regardless of whether they are favourable or otherwise, to any animal in the pedigree. A pedigree so compiled fulfils its proper function. [T. N. Edey.]

The Young Farmer

If you are interested in the foregoing discussion on the value of concentrates for dairy cattle, it is suggested that you open the handbook, " Dairy Farming in Australia " at page 272 and study the next ten pages. This will help you to understand what a cow needs, and how her requirements change according to the season and with changes in the level of her production. Then, in relation to your own farm, ask such questions as these :—

What is the production per acre ?
How does it compare with that of other similar farms ?
Could the farm carry a larger herd ? If so so, is there sufficient labour to handle it ?
If the farm is stocked to capacity, could production be increased by bringing in feed, such as concentrates ? Are the cows inherently capable of increasing their production in response to this extra ration ?
Or could the extra feed have some other effect, such as lengthening the lactation or maintaining production in lean times ?

There may be no ready answers to these and other questions, but they cannot be ignored when any change in feeding policy is contemplated, and they should be examined after any new system has been tried for a time. [K. M. Sillcock.]

PEST DESTROYERS FOR 1953

By F. H. WILLIAMS, M.Sc., Deputy Chief Chemist

IN Victoria, several classes of manufactured chemical products used in agriculture, namely, fertilizers, lime, stock foods, and pest destroyers, must be registered annually with the Department of Agriculture. Each year, lists of the registered brands are published in the *Victoria Government Gazette*, and later reprinted in this Journal. These lists are of interest and value to farmers, horticulturists, and home gardeners, and should be kept for reference. The 1953 list of fungicides, insecticides, &c., published in the Gazette in May of this year, appears in this issue of the Journal.

This Year's List

Following the trend shown in recent years, this year's list is appreciably larger than that of last year. Almost 650 brands are now registered. During last year, a number of new brands were registered after the publication of the 1952 list; most of these have been re-registered this year. A few of the older brands have disappeared, the net result being an increase of about 50 brands. It is interesting to conjecture for how long this annual increase will continue.

The largest increase is shown in the class of "weed destroyers (hormone type)", which contains one-quarter of the new brands. Other new brands are distributed throughout the list. One class of compound appearing for the first time is the chlordane pest destroyer; this is used against the Argentine ant, cockroach, cricket, &c. It consists of a concentrated liquid, which is diluted with water before use. Chlordane is a very poisonous substance, and therefore must be used with care. Regulations requiring certain specified warning notices to appear on all packages containing chlordane, as well as on packages of D.D.T., benzene hexachloride, and several other materials, have been gazetted recently. They are known as the Fungicides Regulations 1953, and will come into operation on the first day of October of this year.

It is interesting to note that even though many new compounds are continually coming on to the market, the older types, such as lead arsenate and lime sulphur, still persist, although in some cases they are being used to a lesser extent.

Pest destroyers used solely for household purposes do not require registration; household fly sprays, insect powders for dogs, fumigation strips for mosquitoes, to mention some of these, therefore do not appear in the list. Again, substances such as drenches and stock medicines generally are registered not with pest destroyers, but under the Stock Medicines Act.

Requirements of the Fungicides Acts

Registration is granted under the provisions of the Fungicides Acts. Application must be made by the wholesale dealer, who is the person primarily responsible for placing the brand on the market. The applicant must state the brand name, and the guaranteed percentages of the active ingredients; he is however not required to give the complete composition of the material, nor to divulge any particulars regarding the manner in which it is prepared. The brand and the guaranteed analysis must appear on the package, and the wholesale dealer is responsible for seeing that at all times the material conforms with the guarantee. Where a departmental standard is prescribed, e.g., with lead arsenate, lime sulphur, arsenical sheep dip, &c., the material must at all times conform to this standard.

Policing the Acts

During the year, samples of different types of pest destroyers are analysed in the departmental laboratory. Some of these samples are taken by the inspector in the course of his ordinary routine duties; others may be taken as the result of complaints by users of particular materials. Where a product is found to be below guarantee or standard, appropriate action is taken.

It must be emphasized that the Acts are designed to protect the purchaser. He can help to protect himself by buying only registered brands of materials, and by reporting to the Department any sales or attempted sales of unregistered pest destroyers.

Information regarding any of the provisions of the Acts, or advice concerning the chemical aspects of pest destroyers, will be gladly supplied on application to the Chief Chemist, State Laboratories, Gisborne-street, Melbourne.

List of Fungicides, Insecticides, Vermin Destroyers and Weed Destroyers Registered at the Office of the Director of Agriculture under the Fungicides Act 1935 (No. 4295) for the year 1953.

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).				Wholesale Dealer.
	Arsenic Pentoxide (As_2O_5) Calculated on the Dry Basis.		Acidity Calculated as Nitric. Dry Basis.	Content of Water.	
	Total.	Water Soluble.			
Arsenate of Lead (Paste).	Minimum. %	Maximum. %	Maximum. %	Maximum. %	
Hortico	32·0	·50	·2	50·0	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Berger's Mercury	31·0	·50	·2	50·0	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
Blue Bell	31·0	·50	·2	50·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant	31·0	·50	·2	50·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Lion	31·0	·50	·2	50·0	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
R & T	31·5	·25	·2	50·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Vallo	32·0	·50	·2	50·0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Tip Top	32·0	·50	·2	50·0	Law, Somner Pty. Ltd., 21 Elizabeth-street, Melbourne
Pannifex	31·0	·50	·2	50·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne, N.1
Lane's	31·0	·50	·2	50·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Arsenate of Lead (Powder).					
Blue Bell	31·0	·50	·2	..	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Arsinette	31·0	·50	·2	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Elephant	31·0	·50	·2	..	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Lion	31·0	·50	·2	..	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
R & T	31·5	·25	·2	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Plane	31·0	·50	·2	..	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Vallo	32·0	·50	·2	..	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Berger's Mercury	31·0	·50	·2	..	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
Pannifex	31·0	·50	·2	..	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Lane's	31·0	·50	·2	..	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Tip Top	32·0	·50	·2	..	Law, Somner Pty. Ltd., 21 Elizabeth-street, Melbourne
Hortico	32·0	·50	·2	..	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Sigma	32·0	·50	·2	..	Sigma Co. Ltd., 562 Little Bourke-street, Melbourne
Unity	32·5	·50	·2	..	T. E. Butler and Co., 486 Collins-street, Melbourne
Arsenate of Lead (with additions).				%	
Blue Bell D.D.T.—Lead	D.D.T.			14·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
	Arsenic pentoxide (As_2O_5)			26·0	
Elephant D.D.T.—Lead	D.D.T.			14·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
	Arsenic pentoxide (As_2O_5)			26·0	
Unity Mercurated Lead Arsenate Powder	Phenyl mercuric chloride			2·5	T. E. Butler and Co., 486 Collins-street, Melbourne
	Arsenic pentoxide (As_2O_5)			31·0	
Calcium Arsenate.				%	
Lion	Arsenic Pentoxide (As_2O_5)			40·0	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Vallo	" " "			40·0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville

Sulphate of Copper (Bluestone).		%	
Blyth's	Copper (Cu)	25·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Jaques'	"	25·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Macclesfield	"	25·0	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
Neptune	"	25·0	" " " " " " " "
Neptune Snow	"	25·0	" " " " " " " "
Hart's Sugar Bluestone	"	25·0	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Hortico	"	25·0	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Lane's	"	25·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster

	Percentage Copper (Cu).	Percentage Copper (Cu) Water Soluble.	Percentage through 200-mesh Sieve.	
Basic Copper Salts.	%	%	%	
I.C.I.A.N.Z. (Carbonate)	52·0	Nil	99·0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
Smutol (Oxychloride)	52·0	Nil	99·0	" " " " " " " "
Vallo Anti-Bunt (Oxychloride)	52·0	Nil	99·0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Cuprox (Oxychloride)	50·0	..	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Elliott's Bunticide	50·0	..	..	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Vallo Copper Spray (Oxychloride)	50·0	..	..	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Copper-50-Spray (Oxychloride)	50·0	..	..	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Kopi (Oxychloride)	50·0	..	..	" " " " " " " "
Cuprolane (Oxychloride)	50·0	..	..	" " " " " " " "
Soltosan (Oxychloride)	50·0	..	..	Fassett and Johnson Ltd., 328 Flinders-street, Melbourne
Elephant Coppo (Oxychloride)	50·0	..	..	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Blue Bell Coppo (Oxychloride)	50·0	..	..	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Kilspor (carbonate)	50·0	·25	97·5	Alf. Hannaford and Co. Ltd., Port-road, Woodville, S.A., and Victoria-street, Dimboola
Neptune (Oxychloride)	50·0	..	..	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne

Bordeaux Mixture.		%	
Hortico (powder)	Copper (Cu)	12·50	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Lion (powder)	"	12·50	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Vallo (powder)	"	12·50	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Bord-O-Kwik (paste)	"	17·5	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Tip Top (powder)	"	12·5	Law, Somner Pty. Ltd., 21 Elizabeth-street, Melbourne
Burgundy or Copper-Soda.			
Neptune Copper Spray	Copper (Cu)	12·5	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
Blue Bell	"	12·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant	"	12·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Paris Green.		%	
Felton, Grimwade, and Duerdins'	Arsenious Oxide (As_2O_3)	50·0	Felton, Grimwade, and Duerdins Pty. Ltd., 342 Flinders-lane Melbourne
Nosco	" " "	57·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Miscellaneous Copper Compounds.		%	
Bordinette	Copper (Cu)	12·7	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Bordesan	"	15·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).			Wholesale Dealer.
Lime.				
	%			
Neptune	Available Lime (CaO) 80			Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
	Thio-Sulphate Sulphur.	Poly-Sulphide Sulphur.	Total Soluble Sulphur.	
	Weight in Volume.			
Concentrated Lime-Sulphur (Solution).	%	%	%	
Hortico	2·5	20·0	28·0	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Blue Bell	2·5	20·0	28·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant	2·5	20·0	28·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Lion	2·5	20·0	28·0	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Neptune	2·5	20·0	28·0	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
Vallo	2·5	20·0	28·0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
R & T	2·5	20·0	28·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Harola	2·5	20·0	27·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Tip Top	2·5	20·0	28·0	Law, Somner Pty. Ltd., 21 Elizabeth-street, Melbourne
Wilmo	2·5	20·0	28·0	Wilcox Mofflin Ltd., 34 King-street, Melbourne
	Sulphur.	Calcium Hydrate.		
Lime and Sulphur (Dry Mix).	%	%		
Pannifex	62·5	35·5		H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Vallo	64·0	35·6		Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Sulphur.	%			
Commonwealth (Dusting)	Sulphur 90·0			Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
,, (Powdered)	,, 99·5			,, ,, ,, ,, ,, ,, ,, ,,
,, (Atomic Dusting)	,, 90·0			,, ,, ,, ,, ,, ,, ,, ,,
,, (Atomic)	,, 99·5			,, ,, ,, ,, ,, ,, ,, ,,
,, (Wetomic)	,, 97·0			,, ,, ,, ,, ,, ,, ,, ,,
Flotox	,, 95·0			H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Neptune (Powdered)	,, 99·0			Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
Vallo (Powdered)	,, 99·5			Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
,, (Dusting)	,, 90·0			,, ,, ,, ,, ,, ,, ,, ,,
,, (Wettable)	,, 98·0			,, ,, ,, ,, ,, ,, ,, ,,
Wetsul	,, 97·0			Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Plane (Dusting)	,, 90·0			N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Blue Bell (Colloidal)	,, 50·0			Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant (Colloidal)	,, 50·0			Jaques Pty. Ltd., 31 Queen-street, Melbourne
Hortico (Dusting)	,, 90·0			Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Spregan (Colloidal)	,, 55·0			Spregan Colloidal Sulphur Pty. Ltd., 90 Queen-street, Melbourne
Cosan (Colloidal)	,, 50·0			Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Nosco (Dust)	,, 90·0			,, ,, ,, ,, ,, ,, ,, ,,
Sulspray	,, 97·5			,, ,, ,, ,, ,, ,, ,, ,,

Spersul	73·0		Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Lion (Wettable)	98·0		Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Wilmo Sulfung (Wettable)	75·0		Wilcox Mofflin Ltd., 34 King-street, Melbourne
Sulfaloid	75·0		Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
Sulfadip	75·0		" " " " " " " "
Rudust No. 9 (Dusting)	99·0		" " " " " " " "
Sigma (Powder)	100·0		Sigma Co. Ltd., 562 Little Bourke-street, Melbourne

Nicotine Sulphate

	%		
Hortico	Nicotine 40		Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Blue Bell	" 40		Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant	" 40		Jaques Pty. Ltd., 31 Queen-street, Melbourne
Plane	" 40		N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Vallo	" 40		Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Black Leaf 40 (Neptune)	" 40		Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
Neptune	" 40		" " " " " " " "
Hart's	" 40		Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Elliott's	" 40		D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Taubman's	" 40		Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
Kix	40		Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
Wilmo	" 40		Wilcox Mofflin Ltd., 34 King-street, Melbourne
Sigma	" 40		Sigma Co. Ltd., 562 Little Bourke-street, Melbourne
Tip Top	" 40		Law, Somner Pty. Ltd., 21 Elizabeth-street, Melbourne
Nico Spray 40	40		Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster

Tar Distillate.

		%	
Ovicide	Tar Oil	48	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
	Phenols	10	
	Mineral Oil	20	
Vallo Ovicidal Wash	Emulsifiable Oils	89	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Blue Bell	" "	89	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant	" "	89	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Hortico (Winterwash)	" "	89	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Winterwash A	Tar Oil	70	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Wintrol (Tar-Oil)	Tar Oils	42·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
	Cresols	4·3	
	Mineral Oil	15·7	
Lion	Tar Oil	70	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Tip Top Ovicidal Wash	Tar Oil	45	Law, Somner Pty. Ltd., 21 Elizabeth-street, Melbourne
	Phenols	9	
	Mineral Oil	25	

White Spraying Oil or Emulsion.

		%	
Hortico	White Mineral Oil	80·0	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Blue Bell	" " "	82·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Alboleum	" " "	80·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Elephant	" " "	82·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Gargoyle	" " "	71·3	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Kleenup	" " "	83·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Lion	" " "	80·0	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Neptune	" " "	84·0	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
" Clarifol	" " "	85·0	" " " " " " " "
Vallo	" " "	82·5	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Volck	" " "	83·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Shell Whitespray	" " "	84·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
R & T	" " "	82·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Atlantic Emulsified	" " "	84·0	Atlantic Union Oil Co. Ltd., 396 Collins-street, Melbourne, C.1
Albarol	" " "	80·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Tip Top	" " "	82·5	Law, Somner Pty. Ltd., 21 Elizabeth-street, Melbourne
Wilmo	" " "	82·5	Wilcox Mofflin Ltd., 34 King-street, Melbourne

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	Wholesale Dealer.
Pale Spraying Oil.	%	
Gargoyle	Pale Mineral Oil 74·6	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Neptune Palsol	" " 85·0	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
Shell Palespray	" " 85·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
Shellicide D.	" " 85·0	" " " " "
Nosco	" " 80·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Blue Bell	" " 82·5	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant	" " 82·5	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Red Spraying Oil.	%	
Hortico	Red Mineral Oil 85·0	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Blue Bell	" " 85·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant	" " 85·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Gargoyle	" " 78·2	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Gargoyle M.	" " 78·2	" " " " "
Lion	" " 85·0	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Neptune "A"	" " 83·0	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
" "C"	" " 70·0	" " " " "
Shell Redspray	" " 83·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
Vallo	" " 85·0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
R & T (Emulsion)	" " 82·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Atlantic	" " 87·0	Atlantic Union Oil Co. Ltd., 396 Collins-street, Melbourne, C.1
Harbas	" " 70·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Tip Top	" " 89·0	Law, Somner Pty. Ltd., 21 Elizabeth-street, Melbourne
Wilmo	" " 85·0	Wilcox Mofflin Ltd., 34 King-street, Melbourne
Scalex	" " 83·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
R & T Super	" " 95·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Winter Spraying Oil.		
(See also "D.D.T. Sprays".)	%	
Shell Universal Winterspray	Solution Nitrated Phenols in Oil 85·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
Winsol	" " " " 85·0	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
Vallo D.N.C.	" " " " 85·0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
	%	
Capsine D.N.O.C. Dormant Ovicidal Spray	Mineral Oil 72·0 Dinitroorthocresol 2·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
D.N.C.	Mineral Oil 80·0 Potassium dinitro-orthocresylate 5·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Gargoyle Superior Winter Spray	Mineral Oil 95·0	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Miscellaneous Spraying Oil.		
Gargoyle Green Spraying Oil	Pale mineral oil 79·0 D.D.T. 3·0 Aliphatic Thiocyanate 1·0	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne

Arsenic (Oxides).	%	
Vallo (White)	Arsenic (As_2O_3) 98·0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
,, (Pentoxide) Granulated	Arsenic Pentoxide (As_2O_5) 89·0	,, ,, ,, ,, ,,
Hart's (White)	Arsenic (As_2O_3) 99·5	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Felton, Grimwade, and Duerdin's (White)	,, ,, 88·0	Felton, Grimwade, and Duerdins Pty. Ltd., 342 Flinders-lane, Melbourne
Snail and Slug Killers.	%	
Bug-Geta	Metaldehyde 1·5	Guano Plant Force and Pest Control Co., 53–57 Munster-terrace, North Melbourne
Sure Death	,, 1·25	Sure Death Laboratories, 2A Lunan-avenue, Drumcondra, Geelong
Defender	,, 1·25	Law, Somner Pty. Ltd., 21 Elizabeth-street, Melbourne
Slugtox	,, 1·5	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Brown Magic	,, 1·0	E. H. Page, 1264 High-street, Malvern
Instant 265	Metaldehyde 1·0 Arsenic (As_2O_3) ·75	F. M. Grant, 9th Avenue, Rosebud
K.O.4	Metaldehyde 1·25 Sodium Silicofluoride 1·0	A. B. Gibson and Sons Pty. Ltd., 106 Stubbs-street, Kensington
Killsem	Metaldehyde 1·25	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Taylor's No. 13	,, 1·46	British Paints (Aust.) Pty. Ltd., 402 Swanston-street, Melbourne
Kix Snail Death	,, 1·25	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
Dinki-di	,, 1·5	Shift-it Products, 4 Roden-street, West Melbourne
Plane Snail-death	Metaldehyde 1·4 Arsenic (As_2O_3) ·75	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Eat-N-Die	Metaldehyde 1·0	Kag Manufacturing Co., 4 Wood-street, Fitzroy
Avery	,, 1·5	Avery's Fertilizer Co. Pty. Ltd., Princess-street, East Preston
Meta Magic	,, 1·25	San Roma Chemical Trading Co., 2 Enfield-road, North Brighton
Miscellaneous.	%	
Felton's Formalin	Formaldehyde 38·0	Felton, Grimwade, and Duerdins Pty. Ltd., 342 Flinders-lane, Melbourne
Sickle or I.C.I. Formalin	,, 38·0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
Vetamac Formalin	,, 38·0	A. H. McDonald, 627–631 Bridge-road, Richmond
I.C.I.A.N.Z. Carbon Bisulphide	Carbon Bisulphide 99·0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
Shirlan A. G.	Salicylanilide 25·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
,, W.S.	Sodium Salicylanilide 98·0	,, ,, ,, ,, ,, ,, ,,
,, 100%	Salicylanilide 100·0	,, ,, ,, ,, ,, ,, ,,
Ceresan	Organically Combined Mercury 1·5	Dalgety and Co. Ltd., 461 Bourke-street, Melbourne
Lunasan	,, ,, ,, 0·54	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Agrosan	,, ,, ,, 1·5	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street Melbourne
Phenyl Mercury Fixtan Spray	,, ,, ,, 3·75	F. R. Mellor and Son, 452 Queen-street, Melbourne
Aretan	,, ,, ,, 3·0	Fassett and Johnson Ltd., 328 Flinders-street, Melbourne
Baytan	,, ,, ,, 3·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Drisan	,, ,, ,, 1·5	,, ,, ,, ,, ,, ,, ,,
Germisan	Sodium salt of Cyan-mercury cresol 30·0	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
	Sodium chloride 60·0	
Tuberol	Stearoptenes and Oleoptenes 70·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Grene Deth	Nicotine 0·58 Sulphur 18·19 Paradichlorobenzene 2·27 Residual Oil 4·22 Naphthalene 2·26 Oil of Citronella 2·0 Ammonia 2·3 Potash Soap 60·0	E. H. Page, 1264 High-street, Malvern
Clensel		Clensel Products Pty. Ltd., Youell and Cowper streets, Footscray
Fluor-o-cide	Sodium Aluminium Fluoride 90·0	Sulphates Ltd., 395 Collins-street, Melbourne
Wilto Soil Treatment	Dimethyl-para-nitrophenyl-thiophosphate 0·5 Potassium permanganate 3·0 Copper (Cu) 12·0 Phenols 5·5	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Cooper's Louse Powder	Benzene Hexachloride 0·6	New Zealand Loan and Mercantile Agency Co. Ltd., 538 Collins-street, Melbourne
Jen's Louse Powder	Sodium fluosilicate 12·5 Tar Salts 2·5 Sulphur 2·5 Tobacco dust ·4	Jen's Vet. Products, 443 Little Collins-street, Melbourne

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	Wholesale Dealer.
Miscellaneous—continued.		
Vallo Manurial Insecticide	Naphthalene 50·0 Sulphur 5·0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Shell D.D. Soil Fumigant	Chlorinated Hydrocarbons 100·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
Tetroc Seed Protectant	Tetrachloroparabenzoquinone 98·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Spergon	" " " 96·0	" " " " " " "
Insecto	D.D.T. 25·0 Hexa-ethyl Tetraphosphate 15·6	" " " " " " "
Destructol	D.D.T. 5·0 Isobornyl Thiocyano-acetate 25·0	" " " " " " "
Banexo Insecticide	Tar Oil 5·6	Walker's Waverley Lime Works, Lara
Anticarie S.D.	Hexachlorobenzene 11·0	F. V. Richards Pty. Ltd., 228 Stanley-street, West Melbourne
Elliott's Puraseed	" 25·0	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Vallo H.C.B.	" 20·0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Buntosan	" 20·0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
Hexcebunt	" 30·0	Timbrol Ltd., 203 King-street, Melbourne
Fusarex	Tetrachlornitrobenzene 3·0	Fassett and Johnson Ltd., 328 Flinders-street, Melbourne
Lane's Tartar Emetic	Potassium antimonyl tartrate 99·75	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Unity Venturicide	Phenyl mercuric chloride 2·5	T. E. Butler and Co., 486 Collins-street, Melbourne
Elliotts Rodeo	Oleo Resin 2·5 Cresylic Acid 35·0	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Calo-Chlor	Mercuric chloride 50·0 Mercurous chloride 50·0	E. P. Keogh Pty. Ltd., 402 Swanston-street, Melbourne
PACA Fungicide	Phenyl-amino-cadmium acetate 20·0	" " " " " " "
Keotized Mercury E	Phenyl mercuric acetate 2·5	" " " " " " "
Elephant Di-Rot	Tetra-methyl-thiuram disulphide 80·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Blue Bell Di-Rot	" " " " 80·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Thiotox 80 Dispersible Powder	" " " " 80·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Blue Bell Di-Rot 50	" " " " 50·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant Di-Rot 50	" " " " 50·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Fernasan	" " " " 50·0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Vallo Thiram	" " " " 80·0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Elephant Ziram 80	Zinc dimethyl-dithio-carbamate 80·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Blue Bell Ziram 80	" " " " 80·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
No-Verm Powder	D.D.T. 1·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Sigma Nox-All Vermin Powder	Benzene Hexachloride 0·1 Dibutyl Phthalate 5·0	Sigma Co. Ltd., 562 Little Bourke-street, Melbourne
Earth-Em	Benzene Hexachloride 0·5	Kag Manufacturing Co., 4 Wood-street, Fitzroy
Bulb-Em	D.D.T. 0·02 Benzene Hexachloride 0·02	" " " " " "
Wiltox	Toxaphene 100·0	Wilcox Mofflin Ltd., 34 King-street, Melbourne
Keogh's Ant Killer	Chlordane 80·0	E. P. Keogh Pty. Ltd., 402 Swanston-street, Melbourne
Kix Ant Killer	" 20·0	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
Di-Ant	" 80·0	Pest Eradicators Pty. Ltd., 45 Sandringham-road, Sandringham
Chek-Pest	" 80·0	Houghton and Byrne (Vic.) Pty. Ltd., Empire Arcade, Flinders-street, Melbourne
Octa-Klor	" 80·0	" " " " " "
duzKIL	" 80·0	Wilcox Mofflin Ltd., 34 King-street, Melbourne
Nicotine Dusting Powders.	%	
Plane Nicodust No. 3	Nicotine 3·00	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
R & T Vegetable No. 1	" 3·00	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Vallo N.40	" 2·50	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Pestend Tobacco Dust	" 0·50	W. D. and H. O. Wills (Aust.) Ltd., 411 Swanston-street, Melbourne
Nico-3-Dust	" 3·00	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Nico-5-Dust	" 5·00	" " " " " "

Arsenical Dusting Powders.		%	
Vallo A.L. 50	Arsenic Pentoxide (As_2O_5)	16·0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Copper Dusting Powders.		%	
Plane Coppodust No. 11	Copper (Cu)	11·00	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Rotenone Dusting Powders.		%	
Katakilla	Rotenone	1·00	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Nosco Derris Dust	,,	0·75	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Derridust	,,	0·50	Houghton and Byrne (Vic.) Pty. Ltd., Empire Arcade, Flinders-street, Melbourne
Hortico Derris Dust	,,	0·75	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Keogh's Derris Dust	,,	0·75	E. P. Keogh Pty. Ltd., 402 Swanston-street, Melbourne
Drymac	,,	0·25	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
D.D.T. Dusting Powders.		%	
Plane Noxide No. 200	D.D.T.	2·00	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Hortico	,,	2·00	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Pespruf No. 2	,,	2·00	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Deedust	,,	2·00	" " " " " " " "
No-Verm Dust	,,	2·00	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Taubman's Rudust No. 5	,,	5·00	Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
,, 15 per cent.	,,	15·00	" " " " " " " "
,, Rudust No. 4	,,	2·00	" " " " " " " "
Neptune Float-On No. 2	,,	2·00	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
,, Float-On No. 1	,,	5·00	" " " " " " " "
Pespruf No. 7	,,	5·00	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Caulicab	,,	2·00	Houghton and Byrne (Vic.) Pty. Ltd., Empire Arcade, Flinders-street, Melbourne
D. Death	,,	2·00	J. D. Harmsworth and Co. Pty. Ltd., 185 William-street, Melbourne
Benzene Hexachloride Dusting Powders.		%	
Gammexane No. 4	Benzene Hexachloride	·5	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
,, No. 10	,,	,, 1·3	" " " " " " " "
,, No. 20	,,	,, 2·6	" " " " " " " "
,, Smoke Generator No. 2 ..	,,	,, 3·25	" " " " " " " "
,, ,, ,, No. 15 ..	,,	,, 5·85	" " " " " " " "
,, ,, ,, No. 22 ..	,,	,, 15·0	" " " " " " " "
,, ,, ,, No. 25 ..	,,	,, 14·4	" " " " " " " "
Plane Gammacide No. 5	,,	,, ·52	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
B.H.C. 4	,,	,, 0·5	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
,, 10	,,	,, 1·3	" " " " " " " "
,, 20	,,	,, 2·6	" " " " " " " "
Lorexane	,,	,, 0·2	Imperial Chemical Industries of Aust. and N.Z. Ltd., 408 Latrobe-street, Melbourne
Gammexane V	,,	,, 0·45	" " " " " " " "
Lindust	,,	,, 1·00	Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
Rudust No. 18 (Grasshoppers) ..	,,	,, 2·6	" " " " " " " "
Cela Nexa Agra	,,	,, 0·5	Wm. Haughton and Co. Ltd., 545 Little Collins-street, Melbourne
,, ,, Pest	,,	,, 1·0	" " " " " " " "

Mixed Dusting Powders.	Nicotine. %	Arsenic Pentoxide (As_2O_5). %	Tar Oil. %	Sulphur. %	
Vallo N.3 A.L.30	3·00	9·60	..	..	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Plane Aphidust No. 3	3·00	..	3·00	..	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Neptune Float-On No. 7	2·50	15·50	..	..	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).			Wholesale Dealer.
Mixed Dusting Powders—continued.	Arsenic Pentoxide (As_2O_5).	Copper (Cu).	Sulphur.	
	%	%	%	
Plane Azurine No. 20	6·2	7·0	40·0	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Vallo Tomato and Vegetable No. 1 ..	16·0	5·0	40·0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
,, ,, ,, ,, No. 2 ..	8·0	5·0	40·0	,, ,, ,, ,, ,,
Tomato No. 2	7·8	4·0	40·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Plane Azurine No. 2	..	7·0	40·0	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
,, ,, No. 4	..	11·0	35·0	,, ,, ,, ,, ,,
Neptune Float-On No. 6	15·5	5·0	40·0	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
Tomato 50	15·5	4·0	42·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Azurine	..	11·0	40·0	,, ,, ,, ,, ,, ,, ,,

	D.D.T.	Nicotine.	Copper (Cu).	Sulphur.	
	%	%	%	%	
Plane Azurine No. 100	1·00	..	7·00	40·00	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
,, ,, No. 200	2·00	..	7·00	40·00	,, ,, ,, ,, ,,
Tomato No. 1	2·00	..	4·00	42·00	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Pespruf No. 5	2·00	..	7·50	40·00	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Plane Tomato No. 200	2·00	..	4·00	40·00	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Neptune Float-On No. 5	2·00	..	5·00	40·00	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
,, ,, No. 3	2·00	2·50	..	..	,, ,, ,, ,, ,,
Rudust No. 1 (Tomato)	2·00	..	4·00	40·00	Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
,, No. 2 (Tomato)	2·00	..	..	50·00	,, ,, ,, ,, ,,
Kix Tomato Dust	2·00	..	7·50	40·00	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
M.I.A. Tomato Dust No. 1	1·00	..	..	50·00	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange. Doncaster
,, ,, ,, No. 2	2·00	..	..	50·00	,, ,, ,, ,, ,,
Sanroma Tomato	2·00	..	4·00	40·00	San Roma Chemical Trading Co., 2 Enfield-road, North Brighton

	D.D.T.	Benzene Hexachloride.	
	%	%	
Pespruf No. 2G	1·0	·13	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
,, No. 4G	2·0	·26	,, ,, ,, ,, ,,
Plane Noxide No. $100G_2$	1·0	·26	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
,, ,, No. $200G_2$	2·0	·26	,, ,, ,, ,, ,,
,, Vegedust	1·0	·40	,, ,, ,, ,, ,,
Neptune Float-On No. 8	2·0	·26	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
Cabbage No. 2	2·0	·26	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Rudust No. 8 Duplex	2·0	·26	Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
Kix Garden	1·5	·13	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne

	D.D.T.	Benzene Hexa-chloride.	Copper (Cu).	Sulphur.	
	%	%	%	%	
Rudust No. 15	1·0	·26	4·0	40·0	Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
Lane's All Purpose	2·0	·26	8·0	42·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Plane G.P.	2·0	·26	4·0	40·0	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
,, Tomato No. 157	1·5	·10	7·0	30·0	,, ,, ,, ,, ,, ,, ,,
,, Potato	1·0	..	9·0	..	,, ,, ,, ,, ,, ,, ,,
,, Lettuce	..	·40	7·0	40·0	,, ,, ,, ,, ,, ,, ,,

Composite	D.D.T.	2·0 %	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
	Pyrethrins	0·1 %	
Neptune Float-On No. 4	D.D.T.	2·0 %	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
	Pyrethrins	0·13 %	
Osmond's Parakyll	D.D.T.	4·0 %	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
	Benzene Hexachloride	0·2 %	
	Tar Acids	2·88 %	
All in One	Copper	5·0 %	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange Doncaster
	Sulphur	40·0 %	
	Nicotine	2·0 %	
	Arsenic pentoxide	7·6 %	
Mortein Garden	D.D.T.	2·0 %	Samuel Taylor Pty. Ltd., 66 Hardware-street, Melbourne
	Pyrethrins	0·23 %	
	Sulphur	20·0 %	
Puff Derris Pump	D.D.T.	2·00 %	Hardware Supplies Pty. Ltd., 145 Queensberry-street, North Melbourne
	Rotenone	0·05 %	
Keogh's Tomato Pest Control	D.D.T.	2·0 %	E. P. Keogh Pty. Ltd., 402 Swanston-street, Melbourne
	Copper zinc chromate	4·0 %	
	Zinc ethylene-bis-dithiocarbamate	0·5 %	
Derris Dust with Nicotine	Rotenone	0·75 %	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
	Nicotine	0·2 %	

D.D.T. Sprays.

Pespruf No. 20 Emulsion	D.D.T.	19·5 %	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
,, No. 50 Dispersible Powder	,,	50·0 %	,, ,, ,, ,, ,, ,, ,,
Vermpruf 1A	,,	10·0 %	,, ,, ,, ,, ,, ,, ,,
Pespruf C	,,	21·0 %	,, ,, ,, ,, ,, ,, ,,
Rucide	,,	50·0 %	Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
Rulene	,,	25·0 %	,, ,, ,, ,, ,, ,, ,, ,,
Rutox	,,	5·0 %	,, ,, ,, ,, ,, ,, ,, ,,
Runol	,,	20·0 %	,, ,, ,, ,, ,, ,, ,, ,,
Rukream	,,	20·0 %	,, ,, ,, ,, ,, ,, ,, ,,
Wellspray Emulsion	,,	25·0 %	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
,, 50 Dispersible Powder	,,	50·0 %	,, ,, ,, ,, ,, ,, ,, ,,
Emulsane 25	,,	25·0 %	,, ,, ,, ,, ,, ,, ,, ,,
Neptune Emulsion	,,	32·0 %	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
Bovox	,,	8·4 %	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
Kix Garden	,,	9·0 %	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
Agro-Kix No. 20	,,	20·0 %	,, ,, ,, ,, ,, ,, ,,
Blue Bell Non-Oil Emulsion	,,	36·0 %	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant Non-Oil Emulsion	,,	36·0 %	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Guesarol G.H. 40 Suspensible Powder	,,	40·0 %	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
,, F.S. 40 Suspensible Powder	,,	40·0 %	,, ,, ,, ,, ,,
,, B.W. 40 Suspensible Powder	,,	40·0 %	,, ,, ,, ,, ,,
Emulsane 50 Paste	,,	50·0 %	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
D. Death Emulsion	,,	20·0 %	J. D. Harmsworth and Co. Pty. Ltd., 185 William-street, Melbourne
,, Poultry Spray	,,	2·0 %	,, ,, ,, ,, ,, ,, ,,
Shell 25 per cent. Emulsion	,,	25·0 %	Shell Co. of Australia Ltd., 163 William-street, Melbourne
Neptune Emulsion 25	,,	25·0 %	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
Osmotox	,,	40·0 %	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
Grazcos Dispersible Powder	,,	50·0 %	Grazcos Co-operative Ltd., 90 William-street, Melbourne
Unity Paste	,,	39·0 %	T. E. Butler and Co., 486 Collins-street, Melbourne
Elliotts Kropgard	,,	30·0 %	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Elliotts Hortogar	,,	20·0 %	,, ,, ,, ,, ,,
Taylor's No. 13 Emulsion	,,	9·5 %	British Paints (Aust.) Pty. Ltd., 402 Swanston-street, Melbourne
Wilmo Twenty	,,	20·0 %	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
Dee Spray	,,	20·0 %	,, ,, ,, ,, ,,
Neptune Dispersible Powder	,,	40·0 %	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
Blue Bell Diaphid	,,	4·0 %	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant Diaphid	,,	4·0 %	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Destructol Powder	,,	20·0 %	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Aphitox	D.D.T.	4·0 %	,, ,, ,, ,, ,, ,,
	Mineral Oil	78·0 %	
Neptune Aphidol	D.D.T.	4·0 %	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
	Mineral Oil	78·0 %	
Shell Aphis Spray	D.D.T.	4·0 %	Shell Co. of Australia Ltd., 163 William-street, Melbourne
	Mineral Oil	78·0 %	
Aphex D.D.T. Dormant Spraying Oil	D.D.T.	4·0 %	Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
	Mineral Oil	75·0 %	

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).		Wholesale Dealer.
Benzene Hexachloride Sprays.		%	
Gammexane No. 7 Miscible Oil	Benzene Hexachloride	7·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
" No. 50 Dispersible Powder	" "	6·5	" " " " " " "
Gamaturf	" "	6·0	" " " " " " "
Nik-kof	" "	5·0	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
Grazcos B.H.C. Dispersible Powder	" "	6·5	Grazcos Co-operative Ltd., 90 William-street, Melbourne
Gamaphex	" "	16·0	Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
Lane's B.H.C. 50 Dispersible Powder	" "	13·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Benz-Aphex	" "	12·5	Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
10 per cent. B.H.C. Miscible Oil	" "	10·0	" " " " " " "
Cela Nexa	" "	16·0	Wm. Haughton and Co. Ltd., 545 Little Collins-street, Melbourne
Gamol	" "	10·0	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Gammexane AP	" "	6·0	Imperial Chemical Industries of Aust. and N.Z. Ltd., 408 Latrobe street, Melbourne
" " Powder	" "	6·5	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Kix Harlequin Bug and Aphis Killer	" "	4·0	Clark, King and Co. Pty. Ltd. 237 Queen-street, Melbourne
Organic Phosphates.		%	
Hexone	Tetraethyl Pyrophosphate	15·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Vallo H.E.T.P.	Hexaethyl Tetraphosphate	95·0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Bluebell Demite	" "	95·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant Demite	" "	95·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Hetraphos	" "	100·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Tephos	" "	80·0	Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
	Tetraethyl Pyrophosphate	20·0	
E 605 Folidol	Diethyl-para-nitrophenyl-thiophosphate	25·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Folidust E 605m	Dimethyl " " " "	1·5	" " " " " " "
Paraphos	Diethyl " " " "	40·0	Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
Phosphone 20 Miscible Oil	" " " " "	20·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Phosphone 15 Dispersible Powder	" " " " "	15·0	" " " " " " "
Blue Bell Parathion 25 per cent.	" " " " "	25·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant Parathion 25 per cent.	" " " " "	25·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Unity Parathion	" " " " "	25·0	T. E. Butler and Co., 486 Collins-street, Melbourne
Shell Parathion 30	" " " " "	30·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
Neptune Insecticidal Wash 30	" " " " "	30·0	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
Blowfly Preparations.		%	
Allkon Blowfly Oil	D.D.T.	5·0	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
	Boric Acid	5·5	
	Phenol and Homologues	22·2	
	Orthodichlorbenzene	5·9	
	Hydro-carbon Oils	8·0	
	Naphthalene	7·5	
Blo-Fli-Di	Benzol	13·7	The Nightingale Supply Co. (Vic.) Ltd., Ingles-street, Port Melbourne
	Sulphur	·8	
	Tar Acids	8·4	
	Petroleum Oils	84·1	
Shell Defiance Blowfly Oil	Coal Tar Products	12·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
	Essential Oils	3·0	
	D.D.T.	5·0	
	Boric Acid	5·5	
Immunol Blowfly Dressing	Phenol and Homologues	22·2	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
	Orthodichlorbenzene	5·9	
	Hydro-carbon Oils	8·0	
Glycerine Di Boric	Boric Acid	21·5	" " " " " " " "
Osblo D.D.T. and B.H.C. Blowfly Dressing	D.D.T.	20·0	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
	Benzene Hexachloride	0·99	
	Chlorbenzenes	62·25	
	Cresylic Acid	7·01	

Hart's Immunol C.B.E.	Boric Acid	10·0	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
	Oil of Camphor	13·5	
	Boric Acid	8·0	
	Zinc Sulphate	1·0	
Vetamac	Tar Oil	2·0	A. H. McDonald, 627–631 Bridge-road, Richmond
	Essential Oils	1·0	
	D.D.T.	0·6	
Calarsenite	Arsenious Oxide	43·0	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Mag-o-Tol	Cresylic Acid	4·0	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Mag-o-Tol plus D.D.T.	Cresylic Acid	4·0	,, ,, ,, ,, ,, ,, ,, ,,
	D.D.T.	1·0	
Squatter Blowfly Oil	Hydrocarbon Oils	84·0	Neptune Oil Co. Pty. Ltd., 51–53 St. Francis-street, Melbourne
	Coal Tar Derivatives	13·0	
	Essential Oils	3·0	
K.F.M. Concentrated D.D.T. Emulsion	D.D.T.	6·0	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
	Tar Acid	7·5	
	Orthodichlorbenzene	15·0	
I.C.I.–B.K.B.	Boric Acid	15·0	Imperial Chemical Industries of Aust. and N.Z. Ltd., 408 Latrobe-street, Melbourne
	Lysol	6·2	
	Orthodichlorbenzene	5·2	
Wilmoff B.K.B.	Boric Acid	15·0	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
	Lysol	5·3	
	Orthodichlorbenzene	5·4	
Hart's Immunol B.K.B.	Boric Acid	40·0	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
	Cresol	6·7	
	Orthodichlorbenzene	14·2	
	D.D.T.	3·0	
Atlantic	Eucalyptus Oil	10·0	Atlantic Union Oil Co. Ltd., 396 Collins-street, Melbourne
	Cresylic Acid	11·3	
	Eucalyptus Residual Oil	50·0	
Blackers	Naphthalene	5·0	Pioneer Chemical Industries Pty. Ltd., 14–24 Lens-street, North Coburg
	Cresylic Acid	2·5	
	Eucalyptus Oil	4·0	
Kleenflox	Phenol	3·0	Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
	D.D.T.	1·0	
	Mineral Oils	61·0	
	Benzene Hexachloride	0·72	
G.M.X.	Tetrachlorethylene	7·5	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
	Tar Acids	7·5	
Younghusband	Tar Oil	55·0	Younghusband Ltd., 94 King-street, Melbourne
	Whale Oil	45·0	
	D.D.T.	15·0	
Kleep	Chlorinated Benzene	44·0	Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
	Sulphanilamide	1·5	
	Bactericide	1·5	
	D.D.T.	4·0	
Benex	Benzene Hexachloride	0·52	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
	Tar Acids	8·0	
	Orthodichlorbenzene	20·0	
Rujet	D.D.T.	25·0	Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
Rapid Fly Dressing	D.D.T.	12·8	Grazcos Co-operative Ltd., 90 William-street, Melbourne
	Cresylic Acid	16·0	
	Orthodichlorbenzene	40·0	
	Naphtha	17·0	
Flyxane	Benzene Hexachloride	3·5	,, ,, ,, ,, ,, ,,
Gammexane Blowfly Dressing	Benzene Hexachloride	0·63	Imperial Chemical Industries of Aust. and N.Z. Ltd., 408 Latrobe-street, Melbourne
Elliott's Magfoil	D.D.T.	2·0	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
	Benzene Hexachloride	0·18	
	Orthodichlorbenzene	32·0	
Elliott's Magspray	Benzene Hexachloride	7·5	,, ,, ,, ,, ,, ,,
Di-Mag	D.D.T.	7·0	The Nightingale Supply Co. (Vic.) Ltd., Ingles-street, Port Melbourne
	Benzene Hexachloride	0·38	
	Tar Acids	3·7	
	Chlorinated benzenes	24·1	
Shell D.D.T. Blowfly Dressing	D.D.T.	5·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
	Cresols	7·0	
	Dichlorbenzene	14·0	
Sickle Gamafly Blowfly Dressing	Benzene Hexachloride	3·5	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
Gama-Dee	Benzene Hexachloride	2·52	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
	D.D.T.	20·0	

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	%	Wholesale Dealer.
Blowfly Preparations—continued.			
Elliott's Ledso	Arsenic Trioxide	60·0	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Wayblo Dressing	Eucalyptus Oil	24·15	W. K. Burnside Pty. Ltd., 34–44 Jeffcott-street, Melbourne
	Ortho-dichlorobenzene	5·19	
	Cresylic Acid	5·19	
Ee-Wee Dressing	D.D.T.	10·0	" " " " " " "
	Cresylic Acid	15·0	
	Ortho-dichlorobenzene	15·0	
C.R.C Blowfly Strike Dressing	Eucalyptus Oil	26·0	Chemical Refining Co., 52 Fawkner-street, Essendon
	Phenol and Homologues	6·0	
	Ortho-dichlorobenzene	6·0	
	Pine Oil	5·0	
Cooper's Blowfly Remedy	Benzene Hexachloride	3·2	New Zealand Loan and Mercantile Agency Co. Ltd., 538 Collins-street, Melbourne
Weevil Destroyers.		%	
Vallo Arsenate of Soda (for treatment of hides)	Arsenic Pentoxide (As_2O_5)	63·0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Shell Weevil Oil	Solution nitrated phenols in mineral oil	85·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
Vacuum Weevil Oil	Pale Petroleum Oil	82·5	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Elliott's Tinbar	Arsenic Trioxide	60·0	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Sheep and Cattle Dips (Arsenical).			
Cooper's Powder	Conforms with standard (Vic. Dept. of Agric.)		New Zealand Loan and Mercantile Agency Co. Ltd., 538 Collins-street, Melbourne
Little's Powder (Ordinary)	" " " " "		Wilcox, Moffl n Ltd., 34 King-street, Melbourne
Quibell's Powder	" " " " "		Dalgety and Co. Ltd., 461–471 Bourke-street, Melbourne
Sickle Powder	" " " " "		Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
Vallo Standard Powder	" " " " "		Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Viper Powder	" " " " "		Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
Kleanflok	" " " " "		J. H. Rudd and Co. Pty. Ltd., 103–105 William-street, Melbourne
Dytic Fluid	" " " " "		Dytic Products Pty. Ltd., 73 Coventry-street, South Melbourne
Miscellaneous Sheep and Cattle Dips.		%	
Cooper's Quickacting Powder	Arsenic (As_2O_3)	22·00	New Zealand Loan and Mercantile Agency Co. Ltd., 538 Collins-street, Melbourne
	Rotenone and allied substances	·70	
" Milk Oil Fluid	Phenols and Cresols	18·00	" " " " " " " "
Hart's Immunol Super	Arsenic	24·50	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
	Cresol	33·40	
	Oleo-resin (Derris)	·82	
	Benzene Hexachloride	·1	
Kymac	Cresols	57·00	Elder, Smith and Co. Ltd., 499–501 Bourke-street, Melbourne
	Rotenone and allied substances	1·33	Younghusband Ltd., 94 King-street, Melbourne
Little's Liquid	Arsenic (As_2O_3)	12·20	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
	Tar Acids	13·00	
" Fluid	Tar Acids	19·00	
Vallo Fluid	Tar Acids	18·00	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Osmond's Ivory Fluid	Tar Acids	18·00	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
Quibell's Special Powder	Arsenic (As_2O_3)	21·60	Dalgety and Co. Ltd., 461–471 Bourke-street, Melbourne
	Rotenone and allied substances	·70	
Little's Supreme Powder	Arsenic (As_2O_3)	19·50	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
	Rotenone and allied substances	·70	
Vallo Dual Purpose	Arsenic (As_2O_3)	21·00	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
	Rotenone and allied substances	·70	
Hart's Immunol Jetol	Benzene Hexachloride	10·0	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne

Immunol Derris Cresol ..	Cresol	60·00	" " " " " "
	Derris Oleo-resin	1·50	
Allkon Derris Cresol	Cresol	60·00	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
	Derris Oleo-resin	1·50	
Udip	Arsenic	23·00	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
	Sulphur	73·00	
	Arsenic	24·50	
Allkon Special	Cresol	33·40	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
	Derris Oleo-resin	·82	
	Benzene Hexachloride	·1	
Elliott's 67 Liquid Dip..	Polysulphide Sulphur	20·00	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
" 128 Liquid Dip	Arsenic (As_2O_3)	60·00	" " " " " "
" 221 Liquid Dip ..	Derris Oleo Resin	2·50	" " " " " "
	Cresylic Acid	35·00	
	Arsenic (As_2O_3)	20·00	
Vetamac	Cresylic Acid	4·00	A. H. McDonald, 627–631 Bridge-road, Richmond
	D.D.T.	2·00	
D-Death Dip	D.D.T.	6·00	J. D. Harmsworth and Co. Pty. Ltd., 185 William-street, Melbourne
	Phenols	31·0	
Young's Green Label	Coal-Tar Hydrocarbons	20·5	Strachan and Co. Ltd., Geelong
	Benzene Hexachloride	7·5	
	Phenols	25·0	
Young's Red Label Paste ..	Tuba-toxins and allied substances	15·0	" " " "
	Arsenic (As_2O_3)	13·5	
Improved Border Paste	Benzene Hexachloride	6·0	Elder, Smith and Co. Ltd., 499–501 Bourke-street, Melbourne Younghusband Ltd., 94 King-street, Melbourne
Quibell's Gamma	" "	6·0	Dalgety and Co. Ltd., 461 Bourke-street, Melbourne
Little's Numex	" "	6·0	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
Sickle Gamalene	" "	3·5	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
Cooper's Gamatox	" "	6·0	New Zealand Loan and Mercantile Agency Co. Ltd., 538 Collins-street, Melbourne
Mobildip	" "	5·0	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Grazcos Gammasol	" "	3·5	Grazcos Co-operative Ltd., 90 William-street, Melbourne
Super-X	" "	10·0	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Ru-Gam	" "	13·0	Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
Sickle Gamalene Special ..	Benzene Hexachloride	3·5	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
	Rotenone and allied substances ..	8·0	
Sickle Double-Action	Arsenious Oxide (As_2O_3) ..	21·0	" " " " " " " "
	Rotenone and allied substances ..	0·7	
Grazcos Arsenical Powder ..	Arsenic (As_2O_3)	21·0	Grazcos Co-operative Ltd., 90 William-street, Melbourne
	Rotenone and allied substances ..	0·7	
	D.D.T.	20·0	
Osmond's Viper Liquid Dip ..	Benzene Hexachloride	0·99	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
	Chlorbenzenes	62·25	
	Cresylic Acid	7·01	
Osmond's Viper Powder Rapid Result Dip	Arsenic (As_2O_3)	21·0	" " " " " " " "
	Derris Oleo-resin	0·7	
	D.D.T.	25·0	
Osmond's Vitix Cattle Dip ..	Benzene Hexachloride	1·5	" " " " " " " " "
	Cresylic Acid	5·0	
Rudip	D.D.T.	25·0	Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
	D.D.T.	16·0	
Gardovis Plus D.D.T. Dip ..	Eucalyptus Oil	10·0	W. K. Burnside Pty. Ltd., 34–44 Jeffcott-street, Melbourne
	Ortho-dichloro-benzene	10·0	

		%	
Weed Destroyers (Chlorates).			
Atlacide C.A. Powder	Sodium Chlorate	50·0 ..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Vertan	" "	99·5 ..	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Nosco Sodium Chlorate	" "	99·0 ..	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Chloracide	" "	99·5 ..	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
Weed Destroyers (Hormone Type).		%	
Methoxone 10 per cent.	Sodium 2-methyl-4-chloro-phenoxy-acetate	10·0 ..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
" 30 per cent.	"	30·0 ..	" " " " " "

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	Wholesale Dealer.
Weed Destroyers (Hormone Type)—continued.	%	
Hormolene	Sodium 2-methyl-4-chloro-phenoxy-acetate 30·0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
Shell Weed Killer "M"	" " " " 30·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
Tuloxone Concentrate 30	" " " " 30·0	Wm. Haughton and Co. Ltd., 545 Little Collins-street, Melbourne
Vetamac S.2,4.D	Sodium 2-4 dichlorophenoxy-acetate 4·0	A. H. McDonald, 627–631 Bridge-road, Richmond
Weedone Lawn Weed Killer	2, 4-dichlorophenoxyacetic acid 35·7	Wm. Haughton and Co. Ltd., 545 Little Collins-street, Melbourne
Weedone Concentrate 57	" " " " 35·7	" " " " " " " "
" Lo-Vol Concentrate 57	" " " " 35·7	" " " " " " " "
Weedar 77	" " " " 48·4	" " " " " " " "
Phenoxone	" " " " 82·0	" " " " " " " "
Chloroxone	" " " " 85·0	" " " " " " " "
Amoxone	" " " " 50·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Wild's 2, 4–D Esters	" " " " 40·0	H. B. S. Wild and Co., 80 Wilson-street, Brighton
" " Amine	" " " " 50·0	" " " " " "
Grazcos 2, 4–D Ester	" " " " 40·0	Grazcos Co-operative Ltd., 90 William-street, Melbourne
" " Amine	" " " " 40·0	" " " " " "
" " Sodium Salt	" " " " 85·0	" " " " " "
Pentol 2, 4–D Powder	" " " " 80·0	Pentol Pty. Ltd., Girdwood-road, Boronia
" " Liquid	" " " " 50·0	" " " " " "
Pixweed (2, 4–D) Liquid	" " " " 10·0	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
" Powder	" " " " 80·0	" " " " " " " "
" Concentrate 50 per cent.	" " " " 50·0	" " " " " " " "
" Ester	" " " " 35·0	" " " " " " " "
Hormex 5x	" " " " 50·0	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
Vallo 2, 4–D	" " " " 82·0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Kix	" " " " 16·7	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
Wilmex	" " " " 84·5	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
Di-Weed 40	" " " " 40·0	Nightingale Supply Co. (Vic.) Ltd., Ingles-street, Port Melbourne
" 50	" " " " 50·0	" " " " " "
2 : 4 Di-Weed	" " " " 70·0	J. D. Harmsworth and Co. Pty. Ltd., 185 William-street, Melbourne
D-Death Weedkiller	" " " " 45·0	Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
Taubmans No. 6	" " " " 81·0	" " " " " " " "
" No. 7	" " " " 40·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
" No. 8	" " " " 50·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Blue Bell Weed-a-Salt	" " " " 84·0	T. S. Nettlefold and Sons Pty. Ltd., 189 King-street, Melbourne
Elephant Weed-a-Salt	" " " " 84·0	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
2, 4–D Selective Weed Killer	" " " " 82·0	Agricultural and Domestic Sprays, 36 Menlin-road, Nunawading
2, 4–D Ester Weed Killer	" " " " 40·0	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Estex 40	" " " " 40·0	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Estar	" " " " 40·0	" " " " " " " "
S–80	" " " " 82·0	T. S. Nettlefold and Sons Pty. Ltd., 189 King-street, Melbourne
Elliott's 2, 4-Ditox	" " " " 40·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
" 2, 4-D-Estox	" " " " 40·0	Agricultural and Domestic Sprays, 36 Menlin-road, Nunawading
Amine 2, 4–D	" " " " 40·0	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
Hart's 2, 4–D	" " " " 80·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Kill-Ester	" " " " 80·0	" " " " " " "
2, 4–D Amine Salts	" " " " 40·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Shell Weedkiller "D"	" " " " 48·4	J. D. Harmsworth and Co. Pty. Ltd., 185 William-street, Melbourne
" "E"	" " " " 36·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Amyne-50	" " " " 50·0	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Vallo Amine Liquid Weedkiller	" " " " 50·0	
Nocweed A	" " " " 50·0	
" E	" " " " 50·0	
" 2, 4-D Sodium Salt	" " " " 85·0	
Estoxone	" " " " 40·0	
D-Death Amine	" " " " 50·0	
Nocweed 2, 4, 5-T	2, 4, 5-trichlorophenoxyacetic acid 36·0	
Killaberry 1600	" " " " 75·0	

Weedone Special 2, 4, 5-T	„ „ „ „	38·0	Wm. Haughton and Co. Ltd., 545 Little Collins-street, Melbourne
„ Blackberry Killer	„ „ „ „	36·0	
Keogh's Brush and Blackberry Killer	„ „ „ „	25·0	E. P. Keogh Pty. Ltd., 402 Swanston-street, Melbourne
Ritex	„ „ „ „	80·0	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
Super Trimex	„ „ „ „	40·0	
Shell Weedkiller "B"	„ „ „ „	38·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
Pentol 2, 4, 5-T	„ „ „ „	25·0	Pentol Pty. Ltd., Girdwood-road, Boronia
T-Death Blackberry Killer	„ „ „ „	40·0	J. D. Harmsworth and Co. Pty. Ltd., 185 William-street, Melbourne
Killaberry 800	2, 4, 5-Trichlorophenoxyacetic acid	37·0	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Hortico Blackberry Killer (concentrate)	2, 4-Dichlorophenoxyacetic acid	37·0	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
2-4-5 T Plus	2, 4, 5-Trichlorophenoxyacetic acid	20·0	T. S. Nettlefold and Sons Pty. Ltd., 189 King-street, Melbourne
	2, 4-Dichlorophenoxyacetic acid	20·0	
Blue Bell Di-Scrub	2, 4, 5-Trichlorophenoxyacetic acid	20·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
„ „ „ No. 2	2, 4-Dichlorophenoxyacetic acid	20·0	
	2, 4, 5-Trichlorophenoxyacetic acid	40·0	„ „ „ „ „ „
Trimex	2, 4-Dichlorophenoxyacetic acid	40·0	
	2, 4, 5-Trichlorophenoxyacetic acid	20·0	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
Di-Weed 5-T Concentrate	2, 4-Dichlorophenoxyacetic acid	20·0	
	2, 4, 5-Trichlorophenoxyacetic acid	37·0	Nightingale Supply Co. (Vic.) Ltd., Ingles-street, Port Melbourne
Finis Black	2, 4-Dichlorophenoxyacetic acid	37·0	
	2, 4, 5-Trichlorophenoxyacetic acid	20·0	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
D-Death Blackberry Killer	2, 4-Dichlorophenoxyacetic acid	20·0	
	2, 4, 5-Trichlorophenoxyacetic acid	20·0	J. D. Harmsworth and Co. Pty. Ltd., 185 William-street, Melbourne
Trioxone	2, 4-Dichlorophenoxyacetic acid	20·0	
	2, 4, 5-Trichlorophenoxyacetic acid	20·8	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Taubmans No. 11 Weedkiller	2, 4-Dichlorophenoxyacetic acid	20·8	
	2, 4, 5-Trichlorophenoxyacetic acid	20·0	Taubmans Chemicals Pty. Ltd., 44 Piera-street, East Brunswick
Elliott's 2, 4, 5-Tritox	2, 4-Dichlorophenoxyacetic acid	20·0	
	2, 4, 5-Trichlorophenoxyacetic acid	20·0	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
H-40	2, 4-Dichlorophenoxyacetic acid	20·0	
	2, 4, 5-Trichlorophenoxyacetic acid	20·0	Agricultural and Domestic Sprays, 36 Menin-road, Nunawading
Weedone Brush Killer 32	2, 4-Dichlorophenoxyacetic acid	20·0	
	2, 4, 5-Trichlorophenoxyacetic acid	8·0	Wm. Haughton and Co. Ltd., 545 Little Collins-street, Melbourne
Vetamac Blackberry Killer	2, 4-Dichlorophenoxyacetic acid	16·0	
	2, 4, 5-Trichlorophenoxyacetic acid	20·0	A. H. McDonald, 627–631 Bridge-road, Richmond
Elephant Di-Scrub	2, 4-Dichlorophenoxyacetic acid	20·0	
	2, 4, 5-Trichlorophenoxyacetic acid	20·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
„ „ No. 2	2, 4-Dichlorophenoxyacetic acid	20·0	
	2, 4, 5-Trichlorophenoxyacetic acid	40·0	„ „ „ „ „
Noxweed Brushkiller	2, 4-Dichlorophenoxyacetic acid	40·0	
	2, 4, 5-Trichlorophenoxyacetic acid	16·4	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange Doncaster
Weedone Di-Ester 40	2, 4-Dichlorophenoxyacetic acid	17·8	
	2, 4, 5-Trichlorophenoxyacetic acid	20·0	Wm. Haughton and Co. Ltd., 545 Little Collins-street, Melbourne
„ Hi-Ester 70	2, 4-Dichlorophenoxyacetic acid	20·0	
	2, 4, 5-Trichlorophenoxyacetic acid	35·0	„ „ „ „ „ „ „ „
Killa-Grass	2, 4-Dichlorophenoxyacetic acid	35·0	
	2, 4, 5-Trichlorophenoxyacetic acid	37·0	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
	2, 4-Dichlorophenoxyacetic acid	37·0	

Weed Destroyers (Miscellaneous).

		%	
A.D.S. Grasskiller	Sodium Trichloroacetate	92·0	Agricultural and Domestic Sprays, 36 Menin-road, Nunawading
Hortico T.C.A.	„ „ „	95·0	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Weedone T.C.A.	„ „ „	94·0	Wm. Haughton and Co. Ltd., 545 Little Collins-street, Melbourne
Nettlefold's T.C.A.	„ „ „	95·0	T. S. Nettlefold and Sons Pty. Ltd., 189 King-street, Melbourne
Keogh's T.C.A. Grass and Weed Killer	„ „ „	90·0	E. P. Keogh Pty. Ltd., 402 Swanston-street, Melbourne
Noxweed T.C.A.	„ „ „	97·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Hall's T.C.A.	Sodium Trichloroacetate	95·0	T. S. Nettlefold and Sons Pty. Ltd., 189 King-street, Melbourne
Gramex	„ „ „	90·0	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
Shell Weedkiller "G"	„ „ „	94·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
Pentex	Sodium pentachlorphenate	90·0	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
Pentol	Pentachlorphenol	90·0	Pentol Pty. Ltd., Girdwood-road, Boronia
Noxweed P.C.P.	„	88·0	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
Pamex Weed Killer	2, 4-Dichlorophenoxyacetic acid	8·0	E. P. Keogh Pty. Ltd., 402 Swanston-street, Melbourne
	Phenylmercuric acetate	2·5	

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	Wholesale Dealer.
Weed Destroyers (Arsenical).	%	
Kix*	Arsenic (As) 68·2	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
Weed-Nox*	" " 64·8	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Bell's Dandy Blue	" " 55·0	Rocke, Tompsitt, and Co. Ltd., 292 Flinders-street, Melbourne
Cooper's Weedicide*	" " 42·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Globe	" " 59·0	Rocke, Tompsitt, and Co. Ltd., 292 Flinders-street, Melbourne
" Weed and Scrub*	" " 21·0	" " " " " "
Vallo Weed, Scrub, and Tree	" " 60·6	Victor Leggo and Farmers Ltd., 288 Williamstown-road, Yarraville
" Arzeen	" " 60·6	" " " " " " " "
" Liquid Arzeen*	" " 65·4	" " " " " " " "
" " Pentoxide*	" " 32·8	" " " " " " " "
Hart's Soluble Arsenic Liquid*	" " 64·4	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
" Killaweed*	" " 30·0	" " " " " " " "
Vetamac No. 1*	" " 28·0	A. H. McDonald, 627-631 Bridge-road, Richmond
Nosco Powder	" " 48·5	Lane's Pty. Ltd., c/o Lawford's Fruit Exchange, Doncaster
" Liquid*	" " 40·9	" " " " " " " "
Elliott's Voskin	" " 60·6	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
" Gortex	" " 48·5	" " " " " " " "
Rabbit Fumigants.	%	
Cyanogas	Cyanogen (CN) 25·0	Cameron and Sutherland Ltd., Riverside-avenue, South Melbourne
Calcynide	" 23·7	Dalgety and Co. Ltd., 1 Malop-street, Geelong
Sigma Bunnigas	" 21·0	Sigma Co. Ltd., 562 Little Bourke-street, Melbourne
Fumoflake	" 20·0	Houghton and Byrne (Vic.) Pty. Ltd., Empire Arcade, Flinders-street, Melbourne
Calcid Briquettes	" 50·0	" " " " " " " "
Calcyan	" 24·0	" " " " " " " "
Liquid H.C.N.	" 94·3	" " " " " " " "
Chlorogas	Chloropicrin 99·5	Cameron and Sutherland Ltd., Riverside-avenue, South Melbourne
Grazcos Chloropicrin	" 99·5	Grazcos Co-operative Ltd., 90 William-street, Melbourne
Fumogas	" 99·5	Wilcox, Moffl.n Ltd., 34 King-street, Melbourne
Larvacide	" 99·0	Houghton and Byrne (Vic.) Pty. Ltd., Empire Arcade, Flinders-street, Melbourne
Sigma Chloropicrin	" 99·0	Sigma Co. Ltd., 562 Little Bourke-street, Melbourne
Hart's Smokogas	Liberates hydrogen sulphide and carbon monoxide	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne

* In liquid form (percentage weight in volume).

Note.—Wherever D.D.T. is mentioned in this list, the percentage shown is in terms of the para para isomer of dichloro-diphenyl-trichloroethane. Similarly, Benzene Hexachloride is shown in terms of the gamma isomer.

W. R. JEWELL, M.Sc., F.R.I.C.

Journal of the Department of Agriculture

VICTORIA

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Cover Picture—Our cover picture, by an official photographer of the Department of Agriculture, was taken at Berry's Creek in the Leongatha district.

Issued by direction of the Minister of Agriculture, The Hon. C. P. Stoneham, M.L.A.

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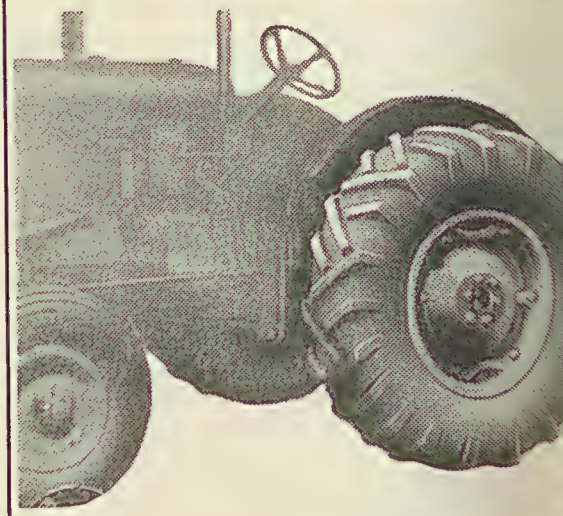

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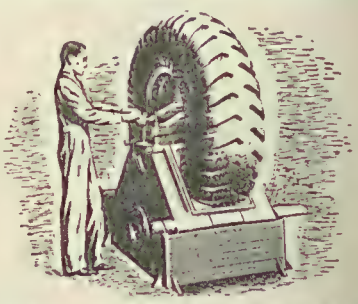

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BEEF CATTLE RESEARCH IN VICTORIA

By A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer.

To supplement the factual information available in Australia on beef cattle the Australian Meat Board and the Commonwealth Bank, three years ago, provided money to enable State Departments of Agriculture to erect weighing scales and cattle yards on suitable properties to assist in the study and behaviour of beef cattle in typical beef-producing areas. By weighing the cattle monthly, it was hoped to determine normal growth progress from weaning to slaughter. Another point being studied in these investigations, which are still proceeding, is whether, by feeding hay at appropriate times, cattle can be fattened a year earlier. Following representations to the Graziers' Association of Victoria, two property owners—one in the North-Eastern District and the other in the Western District—agreed to co-operate with the Victorian Department of Agriculture and provide facilities for the conduct of the investigations. The property owners are Mr. R. G. Ritchie, "Delatite," Mansfield, and Mr. A. B. Ritchie, "Blackwood," Penshurst.

AT Delatite, bullocks which were entirely grass-fed, commenced gaining in live weight about one month after the rains came in the autumn bringing green feed. These gains continued through the winter and spring until the end of December. The live weight of the bullocks then came to a standstill through the hot summer months when there was little or no green feed but ample dry feed. With the early autumn rains there was a sudden fall in live weight brought about by the spoilage of the dry feed before new growth became available. At Blackwood, the supplementary feeding of hay assisted in maintaining more steady growth throughout the year; otherwise the growth curves followed much the same pattern. There was no drop in live weight at Blackwood during the late summer or autumn of 1952, because it was a "green" summer. The summer and autumn rains that year kept the pastures green and growing right through.

NOTE.—This work was previously mentioned in the Journal of Agriculture for September, 1950, pp. 404, 405.

Two- and three-year-old bullocks yarded for weighing at "Delatite".

"DELATITE"

Delatite is an undulating property of 8,000 acres on a carboniferous sandstone formation five to eight miles south-east of Mansfield in North-Eastern Victoria. The soils are loams of good general fertility and the pastures have been improved by top-dressing with superphosphate. The usual fertilizer application varies from 1 cwt. to one bag of superphosphate to the acre every third year and, for the past 20 years, has averaged about $\frac{1}{2}$ cwt. per acre per year on the lower ground and $\frac{1}{4}$ cwt. per acre on the higher slopes. Subterranean clover does well in conjunction with perennial rye grass, annual bromes, fog grass and many less important species. Since the cattle were first weighed in July, 1950, the district has had good seasons. The average rainfall at Delatite is 30 inches.

In 1950, a total of 31·35 inches of rain was recorded. Of this amount, 445 points fell in February and 738 in March, ensuring ample early autumn growth and good winter feed. The winter was relatively dry, but the spring rains were adequate.

The summer and early autumn (1951) were dry until the weather broke in April. The winter rains were ample and were accompanied by much wind and two heavy falls of snow, but there were few frosts to check growth. The spring rains were sufficient for good growth, but much below average in November and December. The total rainfall for 1951 was 30·15 inches.

Following the dry months of November and December, 1951, the pastures were dry and the feed less abundant at the beginning of 1952 than in early 1951. By the time the weather broke again in April, feed was becoming scarce. Very wet weather followed the break and the pastures were soon saturated and remained so through the winter, which was cold with several light falls of snow and very little sunshine. The rainfall for April was 471 points, for May, 486 points and June, 874 points. It was also above average during the rest of the winter and spring. With 45·45 inches, 1952 was the second wettest year on record.

Normally, about 1,200 head of Hereford cattle, which include 180 breeding cows, are run at Delatite in conjunction with Corriedale flock sheep, and Romney Marsh × Corriedale ewes, which are mated to Shropshire rams for fat lambs. About 10 sheep are run to every head of cattle, and, except when the cattle are fattening, the sheep and cattle are grazed together in the various paddocks.

Portion of the cattle are bred on Delatite and the remainder are steers, purchased as stores, for fattening. The cattle used in these investigations have all been bred on the property by mating the breeding cows to Golf Hill, South Boorook, and Collie Creek bulls. The cows are mated at the end of October to calve from the middle of August onwards. Probably September 10 could be taken as the average birth date of steers used in these investigations.

General view of yards and pasture paddocks at "Delatite".

The first weighing at Delatite was made on July 18, 1950, when 25 bullocks from the 1948 drop and 25 weaner steers from the 1949 drop were individually firebranded on the off rump with numbers running from 0 to 24 for both age groups and weighed. One week later, Mr. R. G. Ritchie added another 8 bullocks from the 1948 drop, making 33 in that group. On June 22, 1951, 25 young steers from the 1950 calf drop were branded 0 to 24 and weighed for the first time, and again on June 20, 1952, 25 new steers from the 1951 calf drop were branded 0 to 24, weighed and brought into the trials. Each group of weaners had been weaned from one to three weeks before the first weighing.

The cattle are identified by firebrands on the rump.

The calves are weaned in the paddock and it may be two or three days before all are removed from their mothers. The steer and heifer calves are drafted into separate paddocks at the same time. In some years the breeding herd is fed some hay in the autumn and the hay feeding continues to the weaners for a few days until they settle down after being removed from their mothers. Usually most cows are dry before the calves are removed and there is no setback. No other cattle are given supplementary feed.

The average initial weights of the different age groups are to some extent, a measure of the pasture growth in the summer and autumn before they are weaned as calves. The 1948 bullocks had been through two good autumns before they were weighed and averaged 1,013 lb. in July, 1950, when about 22 months old. At the same weighing, the 1949 weaner steers, when about 10 months old, averaged 648 lb., which was about 100 lb. heavier than weaners of the same age and breeding born in 1950 and 1951. The drier summers and autumns of 1951 and 1952 are believed to be the cause of the lower weights for these two groups.

The effect of season is reflected on the weights of the bullocks. The average live weights of bullocks of the same age at the July weighings in 1950, 1951, and 1952 are shown in Table 1.

The 25 weaner steers or 10-month old bullocks, which averaged 648 lb. in July, 1950, averaged 889 lb. in July, 1951. Similarly, the 25 weaners which averaged 522 lb. in July, 1951, had increased to 843 lb. by July, 1952.

TABLE 1.—THE AVERAGE LIVE WEIGHTS OF 10-MONTH AND 22-MONTH OLD BULLOCKS IN MID-WINTER.

Date of Weighing.	July, 1950.	July, 1951.	July, 1952.
	lb.	lb.	lb.
10-month old bullocks ..	648	522	551
22-month old bullocks ..	1,013	889	843

The 1948 Bullocks

The bullocks dropped in 1948 were drafted from the herd without selection in two lots, as previously mentioned, and appeared to be a good even line, and it was hard to believe that there was a variation of 388 lb. in live weight between the heaviest, No. 25 which weighed 1,190 lb., and the lightest, No. 11, 802 lb. Seven months later No. 25 weighed 1,450 lb. and No. 11, 1,000 lb. No. 11 was a nervous bullock and remained the second lightest throughout. No. 5, 878 lb., had signs of pink eye when first weighed and this seemed to retard his growth right through, although the pink eye had cleared up by the second weighing. He was the only bullock amongst the 33 that had any noticeable trouble, but he finally fattened into a light-weight bullock at 1,196 lb. when 3 years and 2 months old. Twenty-two of these bullocks were marketed in February, 1951, when 2 years and 5

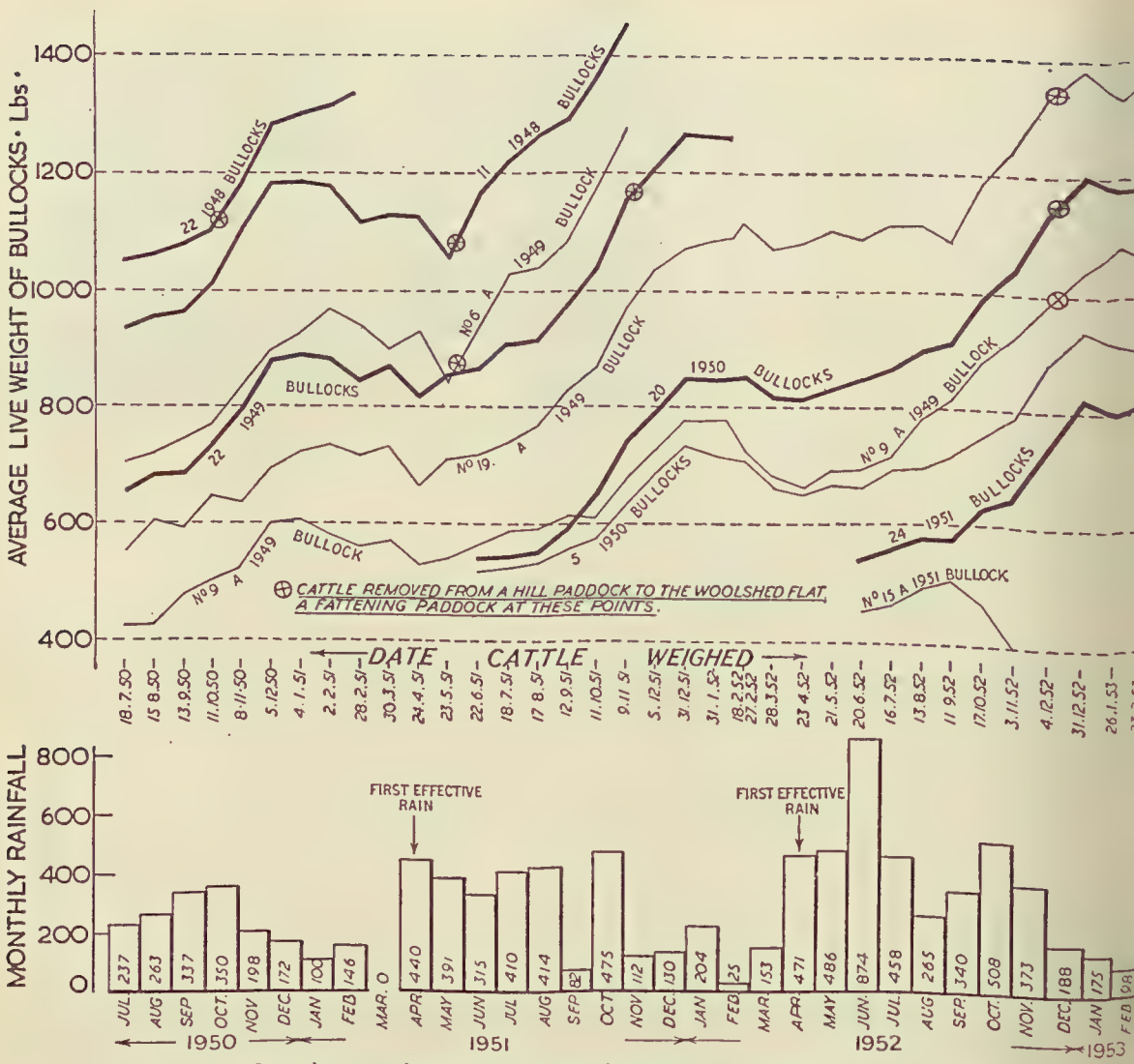

Fig. 1.—Growth rates of bullocks, and monthly rainfall at "Delatite" are shown.

months old, and 11 in November, 1951, when 3 years and 2 months old. Late in October, 1950, the 22 bullocks to be sold in February, 1951, were drafted off and run in the Woolshed Flat, the fattening paddock of 209 acres, with 70 other bullocks. Although drafted in the paddock they were generally the better bullocks. In the growth curves (Figures 1 and 2) the average weights of these two groups of cattle have been graphed separately. Until these 22 bullocks were drafted off, all the bullocks being weighed were run together in No. 2 Bald Hill South, a 364-acre paddock, with 600 ewes which were suckling 550 lambs.

The Woolshed Flat is a fattening paddock in a valley between the hills. Being lower lying it is moister in the summer and the grass remains greener for a longer period into the summer than on the hill paddocks. It has a more dense sole of perennial rye grass.

Eleven of the 22 fat bullocks were sold over the hooks and eleven were sold by auction at Newmarket. Any comparisons between the prices received for the two lots were marred by the severe bruising of three of the animals *en route*. The bruising was so bad that it was not possible to appraise two of the carcasses, one in each lot.

In Table 2 overleaf, the average details of all the carcass appraisals are shown. Except for the bruising, the carcasses were regarded by the trade as ideal for local requirements. They appeared particularly even. The carcasses were appraised by the New Zealand system and some very big differences between the carcasses were obtained for the points allocated for measurement. For an even line of bullocks of the same age and of the same breeding, there was a big difference in the points allocated from a minimum of 43 to a maximum of 67 points, with an average of 58·6 points. The points allotted for measurements varied from 20 to 45, with an average of 34·3, and those allotted by eye judgment varied from 21 to 28, with an average of 24·3.

Also shown in Table 2, are the details of the individual appraisal of the carcasses receiving the highest and lowest scores from bullocks 38-, 29- and 18-months old, which were the ages of the main groups of bullocks slaughtered.

The New Zealand system of carcass appraisal is based partly upon carcass measurements (70 points out of 100) and partly upon eye judgment (30 points out of 100). In many respects, it is similar to the pig carcass appraisal system now widely used in pork and bacon carcass competitions. Beef carcass appraisal has been referred to in the November 1950 issue of this Journal, pp. 507, 508; in the November 1951 issue, pp. 540, 541; and the November 1952 number, pp. 499, 500, and 501.

A reliable method of appraisal based upon measurements would give a practical means of assessing the merits of carcasses and permanently recording them. With the carcasses of the cattle used in these investigations, many measurements additional to those used in the New Zealand system have been made to see if they have any significant value in carcass appraisal.

The eleven 1948 bullocks which were to be marketed in November, 1951, made as much growth during October and November,

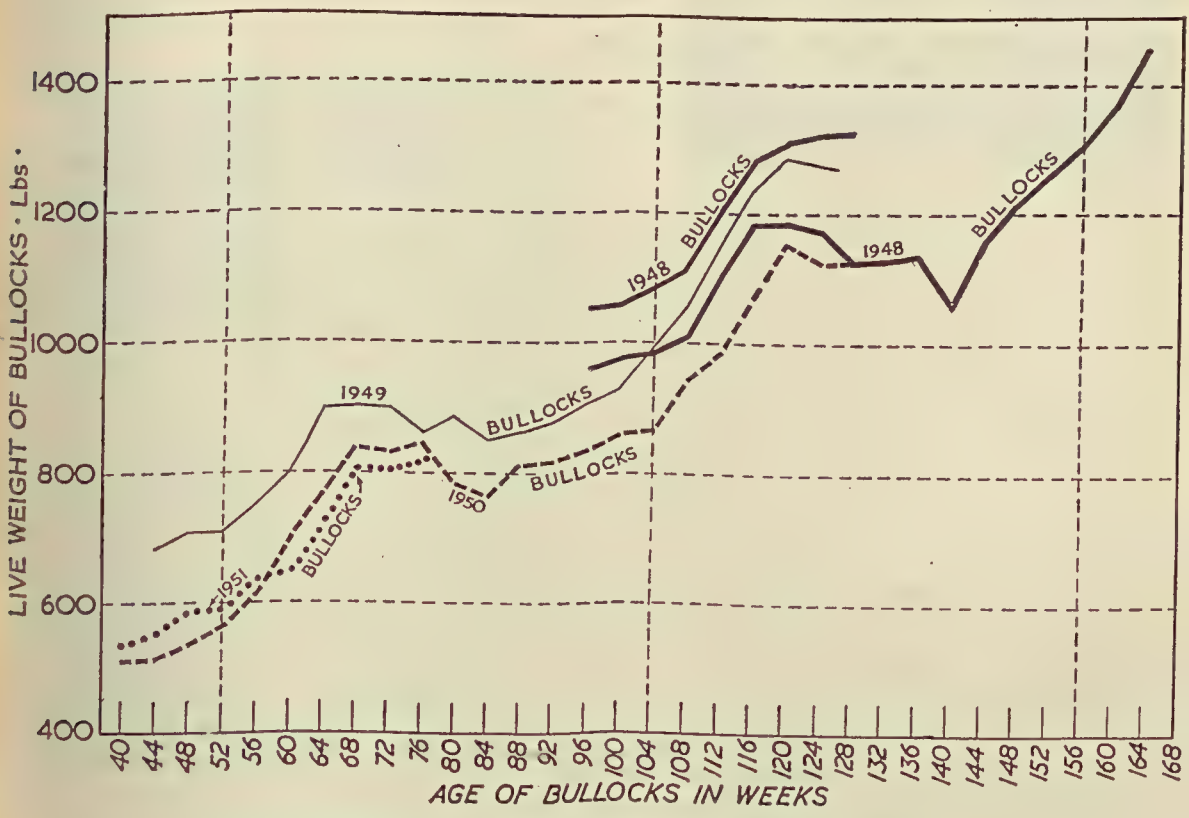

Fig. 2.—Growth curves of bullocks born in different years at "Delatite".

1950, in No. 2 Bald Hill South paddock as their 22 mates which had been drafted off and run in the Woolshed Flat paddock, but from December onwards those in the Woolshed Flat continued to gain until slaughtered, whereas the other eleven in the then dry hill paddock lost weight until the end of May. On June 1, 1951, these bullocks, along with No. 6 from the 1949 group, were drafted into the Woolshed Flat for fattening. They were sold over the hooks on November 20, when they averaged 1,460 lb. at Delatite and dressed out at 851 lb. chilled weight.

TABLE 2.—DETAILS OF CARCASS APPRAISAL. AVERAGE FIGURES EXCEPT WHERE INDIVIDUALLY SHOWN.

Date of Appraisal.	Number of Bullocks.	Age of Bullocks.	Live Weight.	Chilled Dressed Weight.	By Weight and Measurement.												By Eye Judgment.					
					Fullness of Meat.		Fat Cover.				Leg Length.		Balance of Carcass.			Weight Suitability Points.	Rib Cover.		Colour and Texture.		Marbling Points.	Total Points.
					Thickness.	Points.	Number Over-fat.	Number Under-fat.	Thickness.	Points.	Length.	Points.	Weight of Hinds.	Weight of Fore.	Points.		Fat Points.	Muscle Points.	Muscle Points.	Fat Points.		
		mths.	lb.	lb.	mm.				mm.		mm.		lb.	lb.								
Maximum points ..	..	..	..	..	..	20	..	..	..	15	..	20	..	..	10	5	10	5	5	5	5	100
"DELATITE" BULLOCKS.																						
1951.																						
Feb. 21 ..	10	29	1,337	719	54·5	5·4	4	6	28·9	10·5	455	9·6	369	350	6·9	7·2	7·5	4·1	4·0	3·9	4·2	57·3
Mar. 1 ..	10	29	1,318	693	55·2	6·3	6	3	30·3	11·9	454	8·5	352	341	6·1	2·2	7·4	4·4	4·6	4·3	4·2	59·9
Nov. 22 ..	11	38	1,460	851	58·0	4·4	10	1	43·6	5·2	470	10·3	433	418	3·6	0·4	7·0	3·8	3·2	2·9	4·4	45·2
Nov. 22 ..	1	26	1,268	699	61·0	11·0	1	..	30·0	13·0	450	9·0	354	345	6·0	3·0	8·0	4·0	4·0	4·0	3·0	65·0
1952.																						
Feb. 22 ..	22	29	1,230	679	55·1	7·7	5	132	4·91	0·7	454	7·5	349	330	7·5	2·7	7·0	4·0	3·5	3·2	3·95	77
1953.																						
Feb. 26 ..	2	41	1,217	657	63·0	12·5	..	2	21·2	9·5	448	9·0	332	326	5·0	1·5	6·0	4·5	4·5	2·5	2·5	57·5
Feb. 26 ..	20	29	1,184	635	55·5	8·4	3	13	24·6	12·5	447	7·7	326	309	7·7	3·5	7·0	4·0	3·8	4·0	3	2 61
"BLACKWOOD" BULLOCKS.																						
1952.																						
Jan. 25 ..	13	18	950	508	57·3	12·8	8	2	23·4	12·0	406	8·8	265	243	10·0	1·2	5·4	4·5	4·2	3·1	3·5	65 4
1953.																						
Jan. 8 ..	21	30	1,267	732	64·3	11·6	20	..	37·3	7·7	429	13·8	383	349	8·8	1·2	6·0	4·6	4·6	3·0	4·6	66·0
Jan. 12 ..	10	30	..	660	61·4	11·9	7	..	34·0	8·0	413	14·0	345	315	8·9	3·4	6·2	4·3	5·0	3·5	4·8	70·0
HIGHEST AND LOWEST APPRAISALS FOR CARCASSES OF BULLOCKS 18, 29, 30, AND 38 MONTHS OLD.																						
Highest	..	18	..	478	64·0	18·0	1	..	24·0	11·0	380	12·0	253	225	10·0	..	5·0	5·0	5·0	3·0	4·0	73·0
Lowest	..	18	..	483	53·0	11·0	..	1	18·0	13·0	410	7·0	249	234	10·0	..	5·0	4·0	4·0	4·0	3	0 61·0
				480	55·0	12·0	1	..	27·0	8·0	410	7·0	253	227	10·0	..	7·0	5·0	5·0	3·0	4·0	61·0
Highest . ..	..	29	1,094	580	11·0	11 0	Ideal		24·0	15·0	420	9·0	304	276	10·0	5·0	7·0	4·0	4·0	4·0	4·0	73·0
Lowest	..	29	1.338	701	49·0	2·0	..	1	19·0	5·0	488	5·0	364	338	8·0	1·0	4·0	4·0	4·0	3·0	4·0	40·0
Highest	..	30	..	648	69·0	17·0	Ideal		26·0	15·0	410	14·0	341	307	10·0	4·0	7·0	4·0	5·0	4·0	5·0	85·0
Lowest	..	30	..	856	60·0	5·0	1	..	44·0	4·0	437	16·0	429	417	4·0	..	6·0	4·0	5·0	1·0	5·0	50·0
				826	61·0	7·0	1	..	52·0	..	435	16·0	443	383	10·0	..	3·0	4·0	5·0	1·0	4·0	50·0
Highest	..	38	1,520	881	62·0	7·0	..	1	31·0	13·0	462	12·0	449	432	3·0	..	8·0	4·0	3·0	3·0	5·0	58·0
Lowest	..	38	1,490	897	63·0	7·0	1	..	54·0	..	488	8·0	448	449	..	..	5·0	2·0	3·0	2·0	5·0	32·0

For heavy bullocks they were regarded as almost ideal for local trade. They were in fact slightly over-fat. The carcasses appraised rather badly, because the New Zealand system favours lighter carcasses. The low average score of 23·8 points out of a total of 70 for measurements is not comparable with the average score of 34·3 for the 22 mates killed nine months earlier. The total points scored varied from 32 to 58 with an average of 45·2. These bullocks were transported to the works by road. They arrived with very few bruises, but any advantages from road transport were more than offset by the higher cost.

The carcass of No. 5, the lightest of these 1948 bullocks scored 45 points. He weighed 1,196 lb. alive at Delatite prior to despatch and the chilled weight of his carcass was 655 lb. He had fattened unevenly. The fat was 37 m.m. thick where measured along the back between the tenth and eleventh ribs and this was far too thick, and yet for rib cover he was regarded as being too thin and poorly covered with fat. These bullocks varied from 1,196 lb. to 1,584 lb. in live weight and their dressed weights varied from 655 to 920 lb. at three years and 2 months old.

Carcass of one of the 1950 "Delatite" bullocks being dressed at Messrs. Sims Cooper's abattoirs, February, 1953.

The two-year-old bullock, No. 6, sold with this lot killed out particularly well. His carcass was distinguishable from the older ones by the finer textured covering of fat.

Further particulars of these carcasses will be found in Table 2. The growth curves of the 1948 bullocks are shown in Figures 1 and 2.

Depth of eye muscle and thickness of fat are measured where carcasses are quartered. Splendid roasts were cut from this quarter.

The 1949 Bullocks

The 1949 bullocks were a nice lot of weaners and included a late calf, No. 9, which weighed 456 lb. in July, 1950. The weights of the others varied from 544 to 820 lb., the average being 648 lb. The average growth curve of the 22 bullocks marketed in February, 1952, and the individual growth curves of the other three are shown in Fig. 1. The three individuals were Nos. 6, 9, and 19, and they are shown separately because of varying treatments. No. 6 received the same grazing treatment as the eleven 1948 bullocks sold in November, 1951. No. 19 started off at 550 lb. and was the third lightest of the group. He made good progress until November, 1950, when he was affected with photosensitization and, although apparently recovered by December, he made relatively slow growth, but was

An excellent display of carcasses of 1950 "Delatite" bullocks.

about 30 lb. lighter than similar bullocks of the same age, marketed 12 months previously. When appraised, the carcasses scored similar total points to those allotted to bullocks of similar age, twelve months previously. They scored better for muscle development, but were not so good in those points allocated by eye judgment. Average details are shown in Table 2.

In early December, 1952, the twenty best 1950 bullocks and Nos. 9 and 19 remaining from the 1949's were drafted from the mob being weighed, and run in the Woolshed Flat (fattening) paddock. Following the change, these bullocks gained an average of 74 lb. during December to weigh 1,205 lb., lost 21 lb. on the long dry grass during January, and remained stationary during February. They averaged 1,184 lb. when weighed on February 23, 1953, prior to despatch for slaughter. The chilled carcasses averaged 635 lb. when weighed for appraisal, and were regarded as being ideal for local trade requirements, and top price was paid for them on the hooks by Messrs. Sims Cooper Pty. Ltd. When the fat was measured during the appraisal, four had

otherwise a good bullock and could have been sold in February, 1952, if there had been room in the truck for him.

The late calf, No. 9, did well until the green feed dried off in December, 1950, but subsequently did poorly. In April, 1952, he was suffering from pink eye but had recovered by the next weighing. Nos. 9 and 19 were marketed in February, 1953, when they weighed 1,064 and 1,370 lb. respectively. The dressed weights were 551 and 763 lb. The carcass of No. 9 was regarded as being very plain, but on appraisal, it scored 56 points. The carcass of No. 19 was regarded as being very good for a heavy bullock, and had very good muscle development, but on appraisal it scored 59 points only.

The twenty-two 1949-bullocks, to be sold in February, 1952, were drafted into the Woolshed Flat in November, 1951, and were ready for market by January. In January and February, the feed was very dry and the bullocks went back a little before being marketed on the hooks in February, 1952. For the summer trade requirements, they were regarded as ideal, as a little less fat is preferable at that time. They were nearly 100 lb. lighter on the hoof and their carcasses

Three-year-old bullocks yarded prior to weighing and trucking for slaughter in November, 1951.

(continued on page 315.)

Establishment and Improvement of a Dairy Herd

By T. N. EDEY, M.Agr.Sc., Assistant Supervisor of Herd Testing

The first and second instalments of this series of articles, The Establishment and Improvement of a Dairy Herd, appeared in the April and June issues of this Journal.

3. CULLING AND REPLACEMENT POLICY

Improvement in a dairy herd comes from culling the low producers and replacing them with better cows. Since production records provide the only accurate basis for culling and will indicate the best cows from which to save replacements, any constructive herd-improvement policy must be based on continuous testing. Further, the herd test records of the daughters of the herd sire will indicate whether the bull is a wrecker or an improver.

Which Cows should be Culled ?

BROADLY speaking, culling can be divided into two types :—

(*a*) Disposal of cows because of disease, old age, injury, or bad temperament.

(*b*) Culling of low producers.

Although disposal of cows for unsatisfactory dairy temperament—slow milking, irregular milking, flighty behaviour, and so on—is largely at the discretion of the farmer, most culling in category "(*a*)" is of a compulsory nature. Since this compulsory wastage affects high and low producers alike, heavy losses from this cause severely limit herd improvement.

Considerable improvement through culling would be achieved if it were possible to cull, say, the lowest 15 per cent. of the herd and replace them with daughters of cows in the top 40 per cent. of the herd. However, in practice, in Victoria, about 25 per cent. of the herd is replaced annually, a considerable proportion of these being culled for low production. But, in order to rear 25 heifer replacements from 100 cows, many calves from below-average producers will have to be kept, i.e., replacements which may lower the herd average. Where compulsory wastage is high, then, the benefits of additional culling, for low production, are reduced, and consideration must be given to whether culling any but extreme low producers will be beneficial.

In these circumstances, much depends on the productive worth of the herd sire. If he has been proven well above average by the production records of at least six daughters, then it is worthwhile culling

A group of well-reared heifers selected from the leading cows of a tested herd.

low producers even if their replacements are daughters of cows a little below the herd average. If, however, the bull is mediocre or unproven, culling should be confined to the extremely low producers. The cost of rearing young stock is high and, since replacement heifers compete with the milking herd for fodder, a reduction in the number of heifers reared will permit more milking cows to be carried. Although low-yielding cows are relatively unprofitable, it is probably more profitable to milk such cows than to milk fewer cows and rear additional young stock which may prove no better

Where a low wastage rate and a good herd sire make culling for low production advisable, the question arises—which cows should be culled ?

The accuracy of selecting the lowest producers for culling is tied up with the accuracy of our production records as a guide to a cow's inheritance for butterfat production. Because of the manner in which conditions vary from year to year, a single record probably will not give an accurate indication of what the cow's next record will be. But average results from large numbers of records make it possible to predict from one record what a cow is likely to do in a later lactation.

Let us assume that we are considering a mature cow which, in a 300-lb. butterfat herd, produced 200 lb., i.e., 100 lb. below average. Studies of large groups of records indicate that, in her next lactation, she will lag behind the herd average by only 40 per cent. of what she did in her first lactation, i.e., that her next record will be 260 lb. This estimate, of course, applies to the average case and, for individual cows, may be astray.

A production record of a cow is the joint result of her own real ability and the external conditions which affect her. The accuracy of an estimate of her true ability is greatly increased if she has two records for consideration. When a cow is kept for a second lactation she is still the same cow with the same high or low ability to produce butterfat, but she gets a fresh sample of external conditions—health, temperature, feed, and the like. If she had unusually bad conditions for her first lactation it is probable that they will be much better for the second and vice versa.

We never know exactly what influences were operating on a cow during any lactation. When we sort cows merely according to their records, we automatically place in the high group more than a fair share of those which had better luck than average, and in the low group a majority which experienced poorer than average conditions. This is the reason for the general fact that the future production of a cow will usually be nearer to the herd average than her known records are. Consequently, except in extreme cases, cows and particularly heifers, should not be culled for low production on the basis of a single record.

Calves should be judged not on their appearance, but on the production credentials of their parents.

The expense of rearing replacements is such that it is unsound economics to cull them severely after only one lactation. A policy which may pay dividends is to overwinter the doubtful cases, bring them into the herd for a second lactation, and milk them as additional cows through the spring. During most of their lactation period there will be surplus feed available and little danger of overstocking. By the end of the spring, the flush of their year's production will have been obtained, and four or five monthly tests then available will indicate which of them are genuinely poor and which merely had "bad

luck" in the conditions under which they made their first lactation record. The failures can then be culled before feed supplies become short.

Selection of Replacements

Many farmers replace about 25 per cent. of their herd each year. Such a high replacement rate leaves them little choice amongst the calves available for rearing. For example, in a 100-cow herd, it would be necessary to save approximately 30 calves in order to calve down 25 heifers two years later. In practice, it would be found that not many more than 30 heifer calves would be available for rearing, since some of the 100 cows would be empty, others have aborted, some heifer calves would be born dead or die soon after birth, and others born too late in the season to warrant rearing. The position may be worsened if much less than 50 per cent. of the calves are heifers—a frequent occurrence in smallherds.

When a bull is proven superior by the records of his daughters, it is worth culling low producers and replacing them with more of his daughters. This bull's daughters averaged 431 lb. butterfat, compared with their dam's average of 417 lb. butterfat.

Where wastage is so severe that all or almost all available heifer calves must be reared, selection amongst the calves is out of the question. Where surplus calves are available, however, there are certain principles which can give a guide to which are likely to be the best producers. Two main types of decision are involved :—

(*a*) From which cows will calves be kept?

(*b*) If surplus calves are reared, which ones will be kept?

(*a*) The most suitable group of cows from which to save replacements are the cows which, on the basis of at least two records are above the herd average. The daughters of the previous season's top two-year-olds may be kept with reasonable confidence and if, as is usually the case, the daughters of heifers must be kept, those belonging to the best cow families should be selected.

It has been mentioned previously that the quality of the bull in use has an important influence on the performance of the replacements. Often the boost in production due to an outstanding sire will more than make up for the lowering effect of saving daughters from low-producing cows, but the boost will be even greater if only calves from, say, the top 60 per cent. of the herd are saved.

(*b*) When surplus calves are reared, some culling of replacements is possible. What should be the basis for this? Which calves are most likely to develop into cows capable of high levels of production?

Since many diseases have visible symptoms, appearance can give a guide to the young animal's state of health and chances of survival. But a calf's appearance gives a poor estimate of its probable mature level of production. An animal's conformation as a calf may be related to that as a mature animal, but this latter appraisal gives at best only a rough guide to the level of production. External appearance gives an unreliable guide to production in the fully-developed cow—it could scarcely be more informative in the undeveloped calf. Therefore, where possible, selection should be made on the production records of the dams of the calves following the principles already laid down in (*a*) above.

SUMMARY

1. Herd improvement comes from the replacement of low producers by better cows.

2. The lower the compulsory wastage rate, the more effective is culling for low production. Where compulsory wastage is high, only extremely low producers should be culled unless the herd sire is of outstanding quality.

3. Where possible, culling should be delayed until two records are available.

4. Replacements should be selected from the herd's highest producing cows. Two records give a much better estimate of a cow's ability than one.

5. When surplus calves are reared, cull them on their dams' records, not on appearance, except insofar as appearance indicates health.

The final instalment in this series will appear in a subsequent issue of this Journal.

CLASSES FOR FARMERS

Dookie Agricultural College

SINCE November, 1950, when the Victorian Department of Agriculture inaugurated special short courses for farmers and farmers' wives, sons, and daughters at Dookie Agricultural College, no fewer than 992 persons (792 men and 200 women) have attended the classes at the rural training centre for periods varying from one to four weeks. The average enrolment at each class has been 36 students.

Experienced farmers who have attended the courses have expressed both verbally and by letter the highest appreciation of the manner in which the classes have been conducted and the high standard of instruction from both the practical and theoretical aspects. This measure of success has encouraged the Department to proceed with the scheme and to invite anyone associated with farming to take part in one or more of the classes during the ensuing twelve months.

The courses, available from August, 1953, to June, 1954, are listed on the next page. They include instruction in a wide range of subjects to meet all interests.

Students will be brought up to date in their knowledge of the latest practical and scientific developments in the subjects covered by each course, and at the same time will benefit by meeting farmers from all parts of the State and engaging in mutual discussion of problems and subjects of interest associated with their particular line of farming.

Farm bookkeeping has been a popular subject with both men and women students and this subject, together with farm management, are special features in most courses.

Lectures and demonstrations are supplemented by appropriate films and free excursions to selected farms and research stations. Recreational facilities are excellent particularly in the sporting field.

This service to the rural community is provided by the Department of Agriculture at the nominal cost of £2 5s. per week, covering board, lodging, and tuition. Full particulars of the courses may be obtained on application to the Superintendent of Agricultural Education, Department of Agriculture, State Public Offices, Melbourne, C.2. Prospective students are advised to lodge their applications without delay.

SCHEDULE OF SHORT COURSES—DOOKIE AGRICULTURAL COLLEGE.

No.	Dates.	Course.	Subjects.
1	24th August, to 19th September, 1953, inclusive	Dairying and Pig Raising. (Minimum age, 18 years)	Dairying; Pig Raising; Crops and Pastures; Animal Production (includes anatomy, physiology, breeding, foods and feeding); Climate and Soils in Relation to Agriculture (includes study of fertilizers); Farm Management; Farm Bookkeeping
2	24th August, to 19th September, 1953, inclusive	Sheep Husbandry and Wool Classing. (Minimum age, 18 years)	As for the course in Dairying and Pig Raising, except that the subjects of Sheep Husbandry and Wool Classing replace the subjects Dairying and Pig Raising
3	11th to 22nd, January, 1954, inclusive	Special Course for Young Farmers. (Minimum age, 14 years)	Principles of Animal Production and Control of Diseases; Crops and Pastures; Dairying; Pig Raising; Poultry Rearing; Sheep Husbandry; Wool; Soil Conservation; Overseas Market—Distribution of Primary Products; Physical Culture; Discussion Groups Sporting activities and Physical Training will be under the supervision of a Y.F.C.A. supervisor

SCHEDULE OF SHORT COURSES—DOOKIE AGRICULTURAL COLLEGE—*continued.*

No.	Dates.	Course.	Subjects.
4	8th to 19th February, 1954, inclusive	Special Class for Women. (Minimum age, 18 years)	Cooking; Fruit and Food Preserving; Dressmaking; Sewing Machine, care and use of accessories; Health; Social Service Work; Meeting Procedure; Craft Work; Floral Art; Farm Subjects, Dairy, Sheep, Poultry, Gardening, Farm Bookkeeping
5	8th March, to 2nd April, 1954, inclusive	Dairying and Pig Raising. (Minimum age, 18 years)	As for course No. 1
6	8th March, to 2nd April, 1954, inclusive	Sheep Husbandry and Wool Classing. (Minimum age, 18 years	As for course No. 2
7	5th to 9th April, 1954, inclusive	Special Poultry Course. (Minimum age, 18 years)	Feeding; Breeding; Incubation; Brooding; Chicken Rearing; Selection of Stock; Housing; Diseases; Greenfeed Cultivation; Poultry Dressing and Packing; Farm Bookkeeping; Electricity on the Farm
8	26th April, to 7th May, 1954, inclusive	Tractors and Farm Machinery. (Minimum age, 18 years)	The Tractor; General Operation and Care of Tractors, Trucks, and Farm Machinery; Shearing Machinery and Shearing Technique; Care and use of Modern Dairy Machinery; Cereal Harvesting and Tillage Machinery; Soil Conservation Equipment; Horticultural Machinery; Fodder Conservation Machinery
9	10th to 21st May, 1954, inclusive	Soil Conservation and Land Utilization. (Minimum age, 18 years)	Causes of Soil Erosion; Analysis of Soil Problems; Elementary Soil Science; Elementary Surveying; Techniques of Soil Conservation; Soil Conservation Machinery; Land Utilization; Pastures and Crops
10	24th May to 11th June, 1954, inclusive	Horticultural Course. (Minimum age, 18 years)	Pest and Disease Control; Cool Storage; Pollination; Cultivation; Irrigation; Propagation; Pruning; Fertilizers; Botany; Climate; Soil; Manures; Bookkeeping
11	21st June to 16th July, 1954, inclusive	Dairying and Pig Raising. (Minimum age, 18 years)	As for course No. 1
12	21st June to 16th July, 1954, inclusive	Sheep Husbandry and Wool Classing. (Minimum age, 18 years)	As for course No. 2

Book Review

Native Trees of Australia—By J. W. Audas (Whitcombe & Tombs, 50s., 400 pages)

A new and enlarged edition of the work under the same title published some years ago, "Native Trees of Australia" describes the natural habitat, and habit of some hundreds of native trees to be found in the various States of Australia.

Non-technical descriptions aided by line drawings and photographs, will assist those readers whose knowledge of botany may not be extensive, to recognize the principal trees which they may see in the course of their travels through the various States, though many of the less common species are not included. There are many references to the value or possible economical uses of the trees listed, also their suitability for shade and ornamental trees.

The new edition is enlarged to the extent of 100 extra pages compared with the previous edition, and includes appendices in the form of articles, on such subjects as paper manufacture, growing trees from seed, trees for dry areas, &c. This book would provide a source of references for anyone interested in trees or tree-planting.

[GEO. N. HYAM.]

THE DAIRY FARM

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Farm Management is Complex

MANY dairy farmers are anxious to increase their production of milk or butterfat to a higher but still economic level. There are several ways in which they may achieve this larger output without incurring costs out of proportion to the increase, but each of these courses involves far-reaching changes in management.

A dairy farmer might attempt to increase the total amount of feed produced on the farm, but he must then have sufficient labour to handle the larger herd which would be carried. He may need to change his milking methods to make this possible.

He may adopt new grazing practices designed to make some use of that portion of the pasture which normally rots without ever being grazed (as shown in the feeding trials reported in the May issue of this Journal). As this would mean the carrying of extra stock in periods of rapid growth, the new practice would be worthwhile only if the farmer is in a position to conserve more fodder or if he can acquire stock such as bullocks which can be sold at a profit when the rate of pasture growth slackens.

By fodder conservation and by his choice of pasture plants and crops, a farmer may be able to lessen the fluctuations in his feed supply over the year and as between good and poor years, but the greater diversity in the program calls for greater skill in management.

The efficiency with which the herd uses the feed can be increased in several ways. A reduction in the cow replacement rate makes it possible to carry more cows, as less young stock need be reared. A wise choice of calving time for the herd, together with greater attention to feed supplies at certain vital times, may result in a longer average length of lactation in the herd. Improved shed routine may have a direct effect also on length and effectiveness of the lactation. Finally, breeding for higher production offers, on many farms, possibilities of higher output at very little extra cost.

All these changes are being attempted on many dairy farms, despite the complex problems they sometimes introduce. In this month, when a season's profits and costs come under scrutiny, it is appropriate that we should review some of the ideas and practices which have been given much thought during the 1952–53 season.

Fodder Conservation.

Although the State as a whole conserved a record quantity of fodder during the past season, the amount still falls far short of that required to provide for current needs and to ensure, in addition, a safe reserve for the drought which comes daily nearer. Nor will full value be obtained from that which is conserved. The effective amount conserved is not the quantity of material cut from the paddocks but the quantity which will still be fit to be fed to stock when it is needed. A few farmers have become more protection-conscious with regard to fodder, but there is a great need for others to follow their example.

In the wetter districts the buckrake, mounted on the rear of a tractor for hydraulic operation, brought about a new interest in silage making and saved the situation on many farms—where the wet season interfered seriously with haymaking.

Although much silage was spoiled owing to inexperience in the new methods of stacking, over-maturity of the material or, in some instances, lack of understanding of the ensiling process, those who had failures should be prepared to try again. The inclusion of both silage and hay in the program affords a longer harvesting season, gives the task greater flexibility and makes it less dependent upon favourable weather, and affords extra grazing of high quality from paddocks cut early in the season.

Autumn Saving of Pastures.

Autumn saving of pastures for grazing in late winter and early spring is not new. Many an irrigation farmer has his areas of Wimmera rye grass and subterranean clover for this purpose. But the idea of autumn saving has received new impetus with the introduction of "H1" or "Short Rotation" rye grass into dairy pastures. To what extent this valuable grass will withstand the dryness of our summers is not yet known, but it seems certain that it has a place in some of the wetter districts and perhaps also under irrigation.

Strip Grazing.

Portable electric fences are now widely used by Victorian dairy farmers for strip grazing of pastures and crops, and also, on occasions, to separate, say, steep hillsides from the more level areas of the same paddock which are required for harvesting. Strip grazing may be used simply to ensure that maximum use is made of a pasture, in which case the animals are allowed to eat their fill and are merely restricted to a certain area each day. On the other hand, it may be used to restrict the daily intake of specially choice feed, such as a crop, an autumn saved pasture or a small irrigated area in summer, in which case the ration is supplemented by other feed of lower quality. Farmers should bear in mind the distinction between these two uses of strip grazing.

Mole Draining.

The wet season brought about great interest in this form of drainage, but much has yet to be learned about the type of implement and the methods to be used. One thing is clear, namely, that mole draining is effective only if the tunnels have an outlet, either to an open drain or to a larger underground drain.

Tractors.

Light tractors, now extremely versatile, are still increasing in popularity on dairy farms. Farmers are exploring new uses for them, but, in doing so, they are incurring new risks, notably those associated with working on steep hillsides or on silage clamps and at the high speeds of which these tractors are capable. A tractor safety campaign would not be out of place at this stage.

Fertilizer Practices.

While topdressing with superphosphate must remain a standard practice, it is now being supplemented in many places by dressings of potash, lime, and various minor elements. Where these practices have been adopted as a result of needs which have been demonstrated in well planned experiments they must be commended. Often, however, a whole paddock is treated with some minor element without any regard for experimental evidence, and the farmer cannot tell afterwards, with any certainty, whether any benefit has resulted from the new treatment. Even where test strips or plots have been laid down by the farmer, these are often not fenced off, and the grazing of them tends to mask any results which might otherwise be evident. Experiments to date suggest that the need for minor elements is far from universal in Victoria; therefore, farmers would be wise to refrain from applying them to large areas except where the need has been clearly demonstrated.

In regard to potash, many farmers aim to conserve present supplies by good management practices designed to prevent excessive transfer of fertility from one part of the farm to another. Others could well follow this lead.

Herd Improvement.

In adopting 300 days as the standard length of lactation the Victorian Herd Improvement Association has endorsed the value of cows which are persistent producers and the desirability of so arranging feed supplies that a prolonged lactation is possible.

More thought is also now being given to the problem of breeding better cows through the more careful selection of bulls on their production credentials. In addition to bulls bred in dairy studs, bull calves from the better grade herds are now much sought, whereas they were previously in very small demand. [K. M. SILLCOCK.]

Preparation of Cows for Milking

The whole question of milking routine is of vital importance to the dairy farmer. A poor procedure in the milking shed can reduce the yield of milk from the herd and also considerably lengthen the time taken for milking. The latter consequence means that the workers on the farm have less leisure time or, alternatively, are able to devote less time to paddock work.

Let us briefly examine the mode of milk "let-down" in a cow. If no "let-down" of milk is obtained in a cow's udder, the only milk that can be drawn from the teat is that held in the milk cistern, which is a storage situated directly above each teat. Most of the milk is held in the ducts and vessels which lead from the secretory cells to the milk cistern. This milk can only be drawn from the teat after "let-down" occurs and the milk is squeezed from the ducts and vessels into the milk cistern directly above the teat. "Milk let-down" is not a voluntary action on the part of the cow. It occurs when a stimulus is experienced by the animal. This stimulus is transmitted to the brain by the nervous system and it automatically results in the "let-down" hormone being released into the blood stream and thence to the cow's udder. In the udder the hormone causes the muscular tissue around the milk ducts and vessels to contract. By this means the milk is gradually forced into the milk cistern, from which it can be withdrawn through the teat.

For efficient milking it is necessary that complete "let-down" of milk be obtained. The degree of milk "let-down" is very largely determined by the strength of the stimulus experienced by the cow. Recent research work has shown that the strongest practical stimulus is that applied when the udder of the cow is massaged and a squirt of fore-milk taken from each quarter. The teat-cups should then be immediately put on to the teats. It was found that there was no advantage in massaging the udder for a long period. Ordinary methods used for cleaning the udder provide sufficient massage. The cow is a creature of habit and becomes accustomed to these stimuli over a period of time. Hence, any proposed change in stimulating milk "let-down" is best introduced as soon as possible after a cow commences a lactation. In other words, any alteration in milking routine is best affected at that time of the year when the majority of the cows in the herd come into milk. [K. FLYNN.]

The Young Farmer

As indicated in the foregoing paragraphs, dairy farm management is complex and many-sided, and it becomes quite a problem to keep abreast of all the many new developments which continually take place. There is a great deal to be read about dairying, but the task does not end there. It is necessary to compare and contrast the statements of the various writers and to give their work some thought in order to judge whether a new idea can be applied successfully in a particular district.

This is where members of a Young Farmers' Club can introduce a good deal of self help. Since it is almost impossible for any one member to keep fully conversant with all the details in all sides of dairying, it is suggested that club members should become specialists in chosen fields, in addition to their general studies, and that they should from time to time give the club the benefit of their special knowledge by giving a talk or leading a discussion on the selected topic.

You need go no further than the previous paragraphs to find such topics. One member could make a particular study of silage making. Another could look into the question of breeding better cows, while a third could investigate the possibilities and limitations of strip grazing, and so on. Each study should be made in reference to local conditions in your own district.

By merely looking through a telescope you can perceive the general colour pattern of a distant scene, but the details take shape only after the telescope is properly focused. Similarly, the focusing of your investigations through a special study will reveal details, and sometimes vital details, which the general reader would miss. By co-operative effort of this kind the whole club can become better informed.

[K. M. SILLCOCK.]

FRUITGROWERS' FIELD DAY

Horticultural Research Station, Scoresby

The station manager, Mr. R. A. Mullett, points out poor growth made by peach tree on Sweet Almond rootstock.

WELCOMING visitors to the annual fruitgrowers' field day conducted by the Department of Agriculture at the Horticultural Research Station, Scoresby, on Friday, 29th May, Mr. F. M. Read, Superintendent of Horticulture, stated that, although much research work had been seriously interrupted during the past four months by the fruit fly campaign, the work at the station, fortunately, had continued.

Cool Storage Problems

Mr. G. B. Tindale, Cool Storage Research Officer, stated that one problem which confronted the apple industry to-day, was that, as present export varieties matured at times which landed them on the English and Continental markets from April to June, and sometimes as late as July, they were often sold in competition with soft fruits grown in those countries. A high quality variety, which is earlier in maturity than the Jonathan, would allow advantage to be taken of the good markets available in March and April, before these soft fruits appear.

Another problem—low temperature disorders such as scald of Granny Smith and breakdown of Jonathan—has been so successfully overcome by the use of oil paper wraps and correct holding temperatures, that growers now tend to overstore their apples. This results in a poor quality product with little flavour reaching the late local market. Storage methods should be modified to eliminate this problem.

Gravenstein Handling for Export.

The Gravenstein is our earliest quality apple which could be used to provide an export market earlier than the Jonathan but, being early, it has a very short storage life if treated in a manner similar to that used for other varieties. In addition, since it matures in high summer temperatures, the rate of ripening is so rapid that this variety is at its optimum maturity for

storage for about one week only. These problems can be overcome, with a resultant eight weeks' storage life before flavour diminishes, by picking the fruit as soon as the typical flavour has developed, storing immediately and maintaining approximate storage temperatures while packing and delivering to the shipping point. This storage life should be sufficient to allow export under modern shipping schedules.

Gas Storage.

The market supply of apples from October to December is at present composed largely of overstored fruit. One way in which this can be overcome is by the use of gas cool storage instead of the normal air cool storage. As stored apples absorb oxygen and give off carbon dioxide like other forms of plant life, the atmosphere in a sealed chamber soon contains a carbon dioxide concentration of 5 per cent. with a corresponding decrease in oxygen concentration. This reduces the rate of respiration of the fruit tissue and therefore prolongs its life. The carbon dioxide concentration should be maintained at 5 per cent. by controlled ventilation or disorders may develop in the fruit. Normal low storage temperatures, combined with gas storage, would increase the market life of our apple varieties by up to 50 per cent. which would allow high quality fruit to be marketed late in the year and would give a larger post storage life for the handling of such fruit.

For general adoption of this system of storage for late market, it would be necessary to provide rooms of suitable size, and with controlled ventilation, which could remain sealed until October, November, or December.

Growers examining a young tree in the peach rootstock trial.

Current Research Problems

Mr. D. M. McAlpin, Senior Horticultural Research Officer, and Mr. C. R. Brough, Horticultural Research Officer, conducted an interesting dialogue on the current research problems being investigated by them in southern Victoria.

An endeavour was being made to find gnarl-free Gravenstein material by selecting scions from gnarl-free trees in Victoria and working these on to Northern Spy and other rootstocks at the Research Station.

Variegation of Apples.

Variegation of apples, caused by a virus, has appeared extensively in England, where it is causing concern, but in Victoria it does not appear to be serious. A survey has been conducted on some orchards to study its distribution and spread. From work done at the Research Station, it appears that this virus only shows up in trees on rootstocks of Northern Spy or Northern Spy parentage.

Black End of Pears.

Black end of pears is more pronounced in Packham, Williams', and Josephine than in other varieties, particularly Winter Nelis and Winter Cole. It is thought to be related to a stock scion influence and has shown up particularly on Kieffer stock. Work is being conducted to obtain a suitable stock which is not susceptible to the trouble and to determine the full range of varietal susceptibility.

Hormone-Type Sprays.

With the use of alpha naphthalene acetic acid well established as a "stick on" spray for some apple and pear varieties, work is proceeding to find alternative materials for varieties not affected by this substance.

A material called 2, 4, 5–trichloropropionic acid (not to be confused with the blackberry killer

Mr. K. L. Avent, Horticultural Research Officer, describes fertilizer experiments with newly-planted trees.

2, 4, 5–T) was used this season on Packham pears, where it has shown promise in assisting the fruit set.

Blossom thinning with naphthalene acetic acid has been further tested for concentration and correct timing on various varieties. During the last season effective thinning was obtained with naphthalene acetic acid which was combined with lime sulphur for black spot control.

Early Peaches.

In an endeavour to find early peach varieties which are not susceptible to bud "jumping," seedlings of present early varieties have been planted at the Station. Special techniques were necessary in raising these seedlings as early varieties normally set only a low percentage of viable seed.

Fertilizer Trials.

Since the use of foliage sprays of zinc sulphate has proved successful in controlling "little leaf," which is caused by a zinc deficiency, trials are being conducted to test the usefulness of borax sprays against corky core which is caused by boron deficiency. The use of urea as a foliage spray for the supply of nitrogen to trees is also being tested.

Fertilizer trials which have been conducted over the past nineteen years at Mr. Lipscombe's property at Croydon, have shown the need of a balanced fertilizer programme. Where nitrogen alone has been applied as sulphate of ammonia, the leaves show a more severe marginal scorch, caused by a potash deficiency, than where no manure has been applied. On the other hand, complete fertilizer 2 : 2 : 1 has given good growth and yield with no deficiency symptoms.

Peach Rootstocks

The manager of the station, Mr. R. A. Mullett, discussed the peach rootstock and variety trial plot, which was planted in 1951. The trees on Lady Palmerston, Elberta, and Pullar's Cling seedlings were all growing satisfactorily, but those on bitter and sweet almond had shown two faults. Firstly, they had not withstood the wet conditions of last winter and many had a large proportion of dead roots. Secondly, there appeared to be some incompatibility between the almond stocks and the peach scions. This had been manifest by gumming at the union and development of dead tissue in this region. It is fortunate that these faults showed up early in the experiment, as these rootstocks will now be replaced with seedlings of the Royal George variety.

On the suggestion of the advisory committee of the Station, peach seedlings from both Victoria and America, and plum stocks using intermediate stem pieces will be tested as rootstocks for peaches under wet conditions.

Fertilizers at Planting

A trial with a commercial line of Gravenstein trees to determine the effects of various fertilizer treatments at planting time was described by Mr. K. L. Avent, Horticultural Research Officer, who stressed that results so far obtained, should only be treated as progress results, and not regarded as a final statement on the advisability of using fertilizers at this time.

The main trial consisted of treatments of 2 oz. each of sulphate of ammonia and potash salts, and superphosphate at the rate of 5, 10, 20, and 40 lb. per tree, mixed with the earth under the tree before planting. The unusually high quantities of superphosphate used were to test under our conditions the American finding that on certain soils these dressings gave marked tree response.

The high rate of superphosphate applications had a depressing effect on growth, in some cases causing death of the tree. Earlier trials had indicated that ½ lb. per tree was useful and this will be further tested in the coming year.

Potash salts have given no response in tree growth or appearance, but sulphate of ammonia appeared to improve the colour and size of leaves without giving an appreciable increase in growth.

Black Spot on Pears

The aim in the research programme carried out by Mr. P. T. Jenkins, Plant Pathologist, over the past four years has been to replace Bordeaux sprays, which cause russetting, with some of the newer fungicides.

In 1949, "Green tip" and "Finger tip" stage Bordeaux sprays were applied to Packham pears, but the Bordeaux programme was then replaced by twelve newer fungicidal materials. Of these, four materials, phenyl mercuric chloride, thiram, ziram, and bioquin showed promise. These were further tested in 1950, when the former three gave comparably good results, but bioquin failed. Although 1951 season was not favourable to black spot development, observations confirmed the previous results. In 1952, ziram, thiram, and phenyl mercuric chloride gave 95 per cent. control of black spot with only about 1 per cent. of a severity to cause rejection. The mercurials do not appear to give as good control on the leaf as Bordeaux, but the fruit protection is satisfactory. With Josephine pears, the mercurials have caused some mottling and fruit thinning when used at blossom time.

The most important point with the use of any of these materials, is to keep a good cover on the trees from the blossom stage until December.

Black Spot on Apples

Similar results have been obtained on apples as on pears, but where lime sulphur has been omitted, bryobia mite has become a problem. Ziram has proved slightly better than thiram or the mercurials both in the control of black spot and target spot.

The Department is not yet in a position to recommend the use of these materials, but if growers wish to use them it would be advisable to follow the Bordeaux at the "green-tip" stage, with only one selected material.

Apple Rootstock and Pruning Trials

A progress report on the 5-acre block of apple varieties planted on a range of seedling stocks and vegetatively produced Northern Spy stocks and pruned on either the standard vase or modified central leader method, were given by the station manager, Mr. R. A. Mullett.

As would be expected with seedling trees, a wide range of vigor occurs within each stock, but indications are that the trees on these stocks are growing at least as well as on Northern Spy.

Also, in spite of the vigorous growth of trees on some stocks, particularly with the Jonathan variety, the fruit-spur development has been better on seedling stocks than on Northern Spy and on the modified central-leader system of pruning than on the open-vase system.

LIVE STOCK NOTES

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

DRIED SKIM MILK FOR REARING CALVES

MILK drying equipment has been installed and is now operating in many of the factories collecting whole milk from their suppliers. Dried butter milk, dried skim milk, and dried whey are now available, and suppliers of whole milk should be able to rear good calves by feeding a minimum of new milk using gruels made from the dried milk products and pollard or other low fibre cereal meal in its place. Suppliers should be able to buy dried skim milk from their factories for as little as 10d. per lb. for first quality and 7d. per lb. for second quality powder. The food value of the second quality powder is practically equal to that of the first quality powder, and is as good for calf feeding.

Failure to rear calves successfully on gruels as substitutes for new and skim milks is due to a number of reasons. Many of the calf meals which are sold are most unsuitable for feeding to calves. They contain too much fibre and too little protein and they may not contain enough protein of animal origin. The young calf cannot digest fibre and it needs a large amount of good quality protein such as that supplied by milk and its products. The vitamins and minerals supplied by new milk to the very young calf can be obtained by calves of a month old from green pasture pickings, good quality grass hay, and a satisfactory gruel.

Dried skim and butter milks have similar food values and can be substituted one for the other. Dried whey does not contain sufficient protein to make a balanced ration, but the protein it contains is of good quality. As it is not a protein-rich food a gruel made from it would need one of the other powders, dried milk albumin, linseed meal or meat meal added to bolster up the protein content.

It is desirable to feed new milk for at least two and preferably three weeks, and then during the next three weeks to gradually replace the new milk with a substitute. The following substitutes are suggested, and their value as a calf food is roughly in the order in which they are given.

1. Dried skim milk.

2. Equal parts of dried skim milk and pollard.

3. One part of dried skim milk, 1 part of dried whey, and 2 parts of pollard.

4. One part of dried skim milk and 3 parts of pollard.

5. One part of dried whey, 1 part of linseed meal, and 2 parts of pollard.

There are many other combinations of these foods and the gruel could be improved if the pollard were replaced by finely ground wheat or barley.

When making the gruel, mix 1 lb. of the dry food material to 1 gallon of hot water and add a teaspoonful of salt and another of ground limestone. If the gruel tends to scour, it should be boiled. The gallon of gruel should make a good feed for a calf which is a month old. It can be increased or decreased slightly according to the individual requirements of the calf.

Dried skim milk does not contain as much acid as dried butter milk, and it contains a little less fat. The advantage of the lower acid content compensates for the disadvantage of the lower fat content. Dried skim milk (second quality) at 7d. per lb. is cheaper than many calf meals

and is not very much more expensive than the cereal meals and by-products when their suitability as calf foods is taken into consideration. Pollard is the cheapest meal available, and, at 4s. 3d. per bushel, is over 2½d. per lb., but pollard is not digested readily by calves; it contains more fibre and much less of a rather poor quality protein than is required by calves.

Using the various gruels listed above, it would cost up to 1s. 2d. per day to feed a calf on 2 gallons of reconditioned dried skim milk, 9½d. per day on a mixture of equal parts dried skim milk and pollard, and 7½d. per day on a mixture of one part dried skim milk and three parts pollard. All gruels can be improved if any new milk not required by younger calves and unsuitable for sale is added. Early calves born in June, July, and August, can be weaned when 3½ months old, by which time each calf would have received 25 to 35 gallons of new milk, most of which would be unfit for sale for human consumption, and 140 gallons of gruel which would cost from 7d. down to 3¾d. per gallon, depending upon the amount of dried skim milk used.

[A.C.T.H.].

ARTIFICIAL LIGHTS FOR POULTRY LAYING HOUSES

Artificial lights are being used extensively in laying houses by leading poultry farmers. The system was introduced over fifteen years ago, and has increased to such an extent that the majority of commercial poultry farms now have lights installed in their laying houses.

The original purpose in using lights was to extend the daytime period during winter, increase food consumption and obtain more eggs. It was thought that the long period of rest from about 5 o'clock in the evening until 7 the following morning, a period of about fourteen hours, retarded the activity of the reproductive organs, and caused a drop in production.

The introduction of lights at this period has a marked effect on production, but producers found that there was no significant increase in the overall total for the year. The lights enable the poultry farmer to increase winter production and therefore obtain a better average price for his eggs.

Artificial lights are also used to forestall false moult in pullets, and to bring adult birds that have been submitted to a false moult quickly back into production.

Artificial lights will arrest a false moult in pullets only if used before the moult actually sets in. The early symptoms are lowered food consumption and a drop in egg production, and if the lights are used promptly, the trouble may be overcome.

Poultry farmers who use adult hens for breeding are able to bring them through the moult quickly by the use of artificial lights, and have plenty of eggs available early in the breeding season.

It has been claimed that the stimulus derived from artificial lighting is due to its effect on the glandular system, causing, among other things, greater activity of the ovary, resulting in increased egg production.

Artificial lights are still more or less in the experimental stages, and extensive observations are being carried out with duration periods, and lights of various intensity. The flash system consists of 2,000-watt lamps which are switched on for a few seconds twice each night, with a half-hour pause between, is giving satisfactory results. All night lights are giving similar results to those obtained with the regular system of providing the birds with a 14-hour day.

The usual method is to use one 40-watt lamp in each pen, but some breeders claim to have obtained better results with higher-powered lamps. Fluorescent lamps are replacing ordinary lamps because of the absence of shadows. It is interesting to note that all variations of the lighting system are giving satisfactory results. Up to date we are unable to say which is the best system.

The regular system, and the one generally recommended is to instal one 40-watt lamp in each pen fixed to the roof rafter approximately 6 feet from the front. A time clock is set to switch the lights on at 4 a.m. and cut off at daylight. This varies from week to week according to the time of the year, and provides a regular 14-hour day during winter.

[M. D. Hall, Poultry Expert.]

LOIN CUTS OF BACON PIGS

The loin cuts of bacon pigs fall into one of six general classifications. Until general husbandry is on a high level, it is not desirable to sacrifice breeding stock because of poor appraisal results.

In early carcass appraisal work, the most common type of loin cut had little muscle and too much fat. The reaction of many producers was to restrict feeding over the later periods of the pigs' development, and thus, they produced loins lacking in muscle, but covered with either the right amount of fat, or too little fat.

Other producers, realizing that good feeding early in life was necessary to produce good muscle, are responsible for the other three classifications. Firstly: well muscled but over fat—the result of continuing good feeding too long; secondly: the ideal, good muscle, approximately 2 inches thick, and ideal fat, approximately $\frac{4}{5}$ inch thick; and thirdly: the thin well-muscled pig.

In the recent carcass competition, sponsored by the Australian Meat Board, examples of each type were seen. In contrast to early carcass appraisal competitions, only four exhibits were classed as overfat and undermuscled. When alive these pigs generally have a gabled topline, merging into circular shaped flanks.

Five carcasses had too little muscle and fat. Alive, this type of pig looks very thin, and like the preceding group is most undesirable to bacon curers.

There were 36 carcasses having the correct amount of fat, but showing a deficiency of muscle. Alive, many of the pigs in this group could not be seriously faulted, and the majority will be cured into excellent bacon, but they are excluded from the ideal group as the standard was set at 75 per cent. or better of the marks awardable for both fat and muscle.

Among the 25 entries classified as ideal, were 12 of the 13 prize winning entries. In fact the lowest scoring exhibit in this group received 73 marks. The general shape of most pigs in this and the preceding group was that of a building brick on edge, i.e., a long body, a flat top line, and flat perpendicular sides. The only other prize winning entry was in the meaty but thin group. The twelve pigs in this group would have been better if they had been slaughtered a little later. Only two pigs were classified as meaty and overfat. They should have been slaughtered earlier. Pigs in both these groups are rectangular—an indication of meat, but the latter group gives indication of its excess fat by its blockiness.

[A. D. North, B.Agr.Sc., Live Stock Research Officer.]

Left: An ideal loin-cut; Right: This loin-cut exhibiting excess fat and little muscle, is typical of many found in early pig carcass competitions.

Garden Notes for August

By GEORGE HYAM, Horticultural Supervisor

THE FLOWER GARDEN

PLANTING RHODODENDRONS AND AZALEAS

THE ever-increasing number of enquiries received about the allied species, rhododendrons and azaleas, is proof of their popularity and it seems that where troubles occur, most of these are the result of bad environmental conditions due to the failure of the home gardener to appreciate that soil and aspect is most important. This is especially the case when they are to be grown at lower levels and under warmer conditions than their natural habitat, which is always at cool, high elevations, mainly in the Central Asian highlands.

In the highly acid soils and heavy dews of our mountain areas, there are few problems in regard to either soil and aspect. Exposure to strong wind or planting in too shallow soil which might dry out too rapidly in the height of the summer is about the only precaution to take other than guarding against the few pests which attack them, so perhaps it is seeing glorious displays of rhododendrons or azaleas in flower in the Dandenong Ranges or at Macedon, in almost any situation, that may mislead the novice gardener in other areas into planting them in the wrong place. But given certain conditions of soil and aspect plus plenty of moisture in dry weather, both can be grown successfully in most parts of the State and particularly in southern districts.

Most people are aware of the need for a highly acid soil but many do not realise that where the acidity of any soil has to be increased, this should be done in such a manner that the acidity is well maintained throughout the life of the plant by adding plenty of highly acid organic matter rather than by chemical means which can leach out rapidly and often diffuse to nearby plants which do not relish such acid conditions.

This is best done by incorporating into the soil liberal quantities of peat, tanbark, leafmould made from deciduous trees (oak leaves preferred) or sawdust for a distance of at least 3 feet round each young rhododendron or 2 feet round an azalea plant. As they grow, acidity will be maintained by an annual mulch of the same materials spread round their root area which is roughly equivalent to the spread of the branches. In the first instance when planting, an amount equal to one part of one of these acidifiers to two parts of the filling-in soil would not be too much and even fairly acid soils will benefit by this addition. Expressed in terms of the pH scale, with the exception of a very few species, most of which are not grown here, rhododendrons will never be at their best beyond a range of 4·5 to 5·5. Azaleas flourish best in the same range but are rather more tolerant of low acid conditions, say up to six on the pH scale.

Too low acidity is first indicated by a paleing or yellowing of the margins of the leaves or pale spots thereon and by a general unthrifty growth, and this can be temporarily checked by adding a chemical acidifier until the benefit of a replaced organic mulch is apparent some weeks later.

Selecting a Site

Apart from hill districts, aspect is of great importance. Both species need some sun and in the warmer districts, this should be mainly the early morning sunshine from the east and the more they get from this direction the better. Where this is not possible, these plants will do reasonably well in other positions if they are given some protection overhead from the direct mid-day and early afternoon sun by the overhanging branches of nearby trees or by the provision of a not too dense cover of brush-wood. Wherever they are planted, these species should have full protection from hot north and west winds in summer as their next season's flower buds are formed at that time and are easily scorched by these winds. While they need a moist soil at all times, rhododendrons and azaleas will not tolerate bad drainage. The suggested organic

dressings when planting and thereafter also maintain and slowly release moisture better than where the humus content is low. The annual mulching is also important in protecting their delicate and shallow root system from heat and competition with weed growth. Rhododendrons and azaleas should be planted where they will get a minimum of disturbance by the cultivation of other plants at least within a foot or two of the perimeter of their branches. Mulching is also important for young plants until their lower branches grow sufficiently to protect their root area from heat and direct sunlight.

Established Rhododendrons and Azaleas

Apart from the mulches already described, the fertilizer requirements should not be great in reasonably good garden soil. They do however, respond to nitrogen applied in early August and phosphate and potash have an influence on the flowering later in spring. The complete 2 : 2 : 1 super., ammonia and potash mixture plus half a part of sulphate of iron, applied at the rate of 2 oz. per square yard of the root area seems to suit all soils. Liquid manure made from cow manure applied in two or three dressings at intervals of about three weeks prior to the flowering period also gives results. Overfeeding can cause excessive leaf growth.

Where there are signs of too low acidity, watering on a solution made from equal parts of alum and sulphate of iron will correct this condition for the time being. The rate should be equal to about 1 oz. per square yard of the dry material.

The natural habit of both rhododendrons and evergreen azaleas is bushy with the lower limbs almost touching the ground as they reach maturity. This shape should be preserved. Pruning is seldom necessary in the early stages of growth and should always be light at any one time. Bare stems can be obviated without drastic cutting, which might injure the plants, by cutting off the faded flowers with a very short stem as soon as the petals fall. Any heavier pruning, if such is necessary, should only be done to a point on not more than two-year-old wood, which are stems of either green or red colour, and not down to the older wood with greyish bark.

Whenever opportunity offers, apart from any necessary heavier watering, give the foliage of both species a light sprinkling, preferably in the evening.

Controlling Red Spider and Thrips

These are the main pests affecting these species, and are responsible for the silvering and the fading of the leaves and damaged flowers. Aphids and scales sometimes occur. Applying a white oil spray in July or early August should be the first preventive step and for the prevention of trouble from red spider and rhododendron thrips, there is nothing better than a lime-sulphur spray or two in September or early October, taking care the backs of the leaves are coated. If they appear later, another lime-sulphur spray can be applied. If there is any objection to the temporary whitish deposit on the leaves, a nicotine and white oil solution could be used but this seems less persistent and may need more applications.

Gardeners in northern districts and others who have no favourable garden conditions can grow rhododendrons in tubs under bush-house conditions which allow some sun to penetrate. The general method of cultivation is the same as outdoors but use a mixture of equal parts of the organics and of light soil. The feeding should be lighter and preferably in the form of liquid manure and a mulch of cow manure. Frequent top watering is essential in dry weather.

Azaleas are especially good tub plants or they can be grown satisfactorily in 10-inch pots.

The propagation of rhododendrons and similar species was dealt with in the November, 1949, and November, 1950 issues of this Journal.

THE VEGETABLE GARDEN

Spring-sown Root Crops

Root crops like carrots, parsnips and beetroot sown last summer and autumn should still be usable but any that remain at the end of August will have to be lifted and stored in boxes of sand or in clamps as they will run to seed soon after. Such stored roots will be usable until the end of October if put down properly and if no damaged roots were included. Their

foliage should be cut off within an inch of their crowns otherwise this can set up a decay.

The aim of every home gardener should be to keep a continuous succession of roots available for use throughout the year and in most areas it is quite possible to use them direct from the ground with the exception of September and October in the south. Stored roots could be used during that period. In the warmer northern areas, this lapse is shortened or unnecessary as it is possible to make the first sowings earlier.

July or early August sowings will produce usable roots in early November though in the cooler areas, carrots and parsnips may not be fully grown which, in so far as the home gardener is concerned, raises another point. Many people from overseas complain that in general, the average root vegetable sold in our shops is too mature, and anyone who compares the delicate flavour of half to three-quarter grown carrots and beetroot with matured roots which have been in ground for some weeks will certainly agree.

While it is doubtful whether a commercial grower would be able to command the necessary extra price for small roots at present, and until the housewife who buys vegetables in shops realises what constitutes superior quality, the home gardener can easily produce a high quality table vegetable by sowing only short rows in fairly frequent succession during the long sowing period for such crops made according to district sowing times. This is better than the usual practice of sowing an early spring crop and then a larger sowing in the main crop season from November–February to last over the winter until the following September. Small but frequent sowings also avoid a long gap if something should happen to spoil one crop.

To some extent, the flavour of root crops and particularly that of carrots is affected by soil conditions, fertilizers, and growing conditions generally as well as the strain or variety of the seed. An excess of nitrogenous fertilizer and a lack of potash is said to be an influence and certainly any interference or check in normal growth can alter the flavour of carrots. Second growth can cause a bitterness.

The ideal fertilizer probably varies with different soils but in most cases, for any garden soil which is reasonably well provided with humus, which is the first essential for good roots, a complete fertilizer of the market gardener's type is generally satisfactory. In very sandy soil, probably 5 : 1 : 1 super., ammonia and potash would be better. The rate for all roots should be about 1 oz. per running yard of row, half of which is best placed in 2-inch deep drills each side of the seed row and about 2 inches away from the seed.

Carrots and Parsnips Need a Friable Soil.

Unless the soil is friable and deep, it is almost useless to expect good carrots or parsnips. Home gardeners on heavy soils can however, get more or less ideal conditions by taking out a narrow trench about spade deep and filling this with a sieved mixture of soil made friable by mixing four parts of soil to one of compost. As an 8 or 10 feet row is quite sufficient for one sowing, this extra work is well worth while. Even in poor, light soil the same procedure will produce better results.

Sowing Depth Important.

A poor germination is very often due to sowing too deeply or allowing the top soil to dry out before the plants are well through. Covering the seed to a depth of half to three-quarters of an inch is quite sufficient for carrots, parsnips and beetroot.

Protect Carrots Against Aphids and Jassids.

The most usual causes of failure with carrots and to a lesser extent parsnips is due to aphis attack in spring and yellow jassids in summer. These insects can destroy young roots and debilitate older plants to the extent that their quality and size is very poor, but what is even worse, they can and do transmit carrot virus which is deadly to carrots. Virus resistant strains of carrot like Osborne Park and Topweight can now be recommended for spring planting in particular, but these can still suffer from the effects of the sucking of these insects. A crop can be protected by three-weekly dustings or sprays of a D.D.T. compound and good results have been obtained from liquid B.H.C. sprays as an alternative. The main point is to commence when the plants first come through as this is probably when most of the damage is done.

the ideal thickness of fat, three were slightly overfat and thirteen were slightly underfat.

The total points scored for appraisal varied from 49 to 73 points, with an average of 62 points. Further details are shown in Table 2. Five of the 1950-bullocks being weighed are still at Delatite grazing in one of the hill paddocks with the 1951's and sheep.

The 1951 Bullocks

The 1951 bullocks were similar to the 1950's, but four of them were affected by photosensitization in October, 1952. This brought the average weight below that of the 1950's. One of the bullocks, No. 15, was very badly affected and died during November. The others recovered and were making normal gains by December.

The Growth Curves

In Figure 1, the average liveweights, in lb., of the different groups of Delatite bullocks and the individual live weights of three bullocks already mentioned are shown in the graphs against the weighing dates. Below the growth curves, the rainfall for each month, in points, is graphed. The months when first effective autumn rains fell are indicated.

In Figure 2, the average live weights in lb. of the different groups of Delatite bullocks are shown against the ages of the bullocks in months. The growth curves follow a similar pattern from one year to the other. The effects of the season on the quality of the summer and autumn pasture and the amount of green feed in it are offered as the explanation for the variations in the average live weights of the different groups of weaners at the commencement of weighing in mid-winter when 40–44 months old.

The three-year-old bullock on scales (in steel cage, unseen) weighed 1,400 lb.

A study of the growth curves (Figs. 1 and 2), shows that the bullocks made steady gains through the late autumn one month after the weather broke in April and through the winter. During the spring the rate of growth increased and then steadied off towards the end of the year. Through the summer the bullocks have usually held their weights, but during the wet weather immediately following the autumn break, when the dry feed had been spoiled and before the green feed had grown long enough to be grazed, the bullocks lost 30 to 60 lb. per head in live weight.

"BLACKWOOD"

"Blackwood" is a property of 12,500 acres on the basalt plain about 7 miles north-east of Penshurst. The soils are clay loams formed in situ from the basalt and are of good general fertility. The property is gently undulating with small outcrops of basalt and is drained by numerous creeks. The property is subdivided into about 120 paddocks, which are watered from sub-artesian bores. The pastures have been topdressed with superphosphate for the past 20 years, receiving in all an aggregate of 7 to 8 cwt. per acre.

Aberdeen Angus bulls, mostly from the Valle Pacis stud part of which was purchased in 1951 by Mr. A. B. Ritchie who is now breeding his own bulls, have been used for a number of years. Originally, the breeding cows were Hereford and Red Poll but the present-day cattle are seven-eighths to pure Aberdeen Angus. Many of the cattle weighed have white faces and one was a blue roan. Only small numbers of locally bred store cattle are purchased. Normally, 2,400 head of beef cattle are depastured on Blackwood. A share dairy herd, in which there are about 120 head of Jersey cattle of all ages, is milked on the property.

Large cross-bred sheep, of which one-third are breeding ewes, are maintained and generally about 7 sheep to every beast are carried. Seldom are the sheep and cattle grazed together in the one paddock, but the cattle are grazed in rotation with sheep.

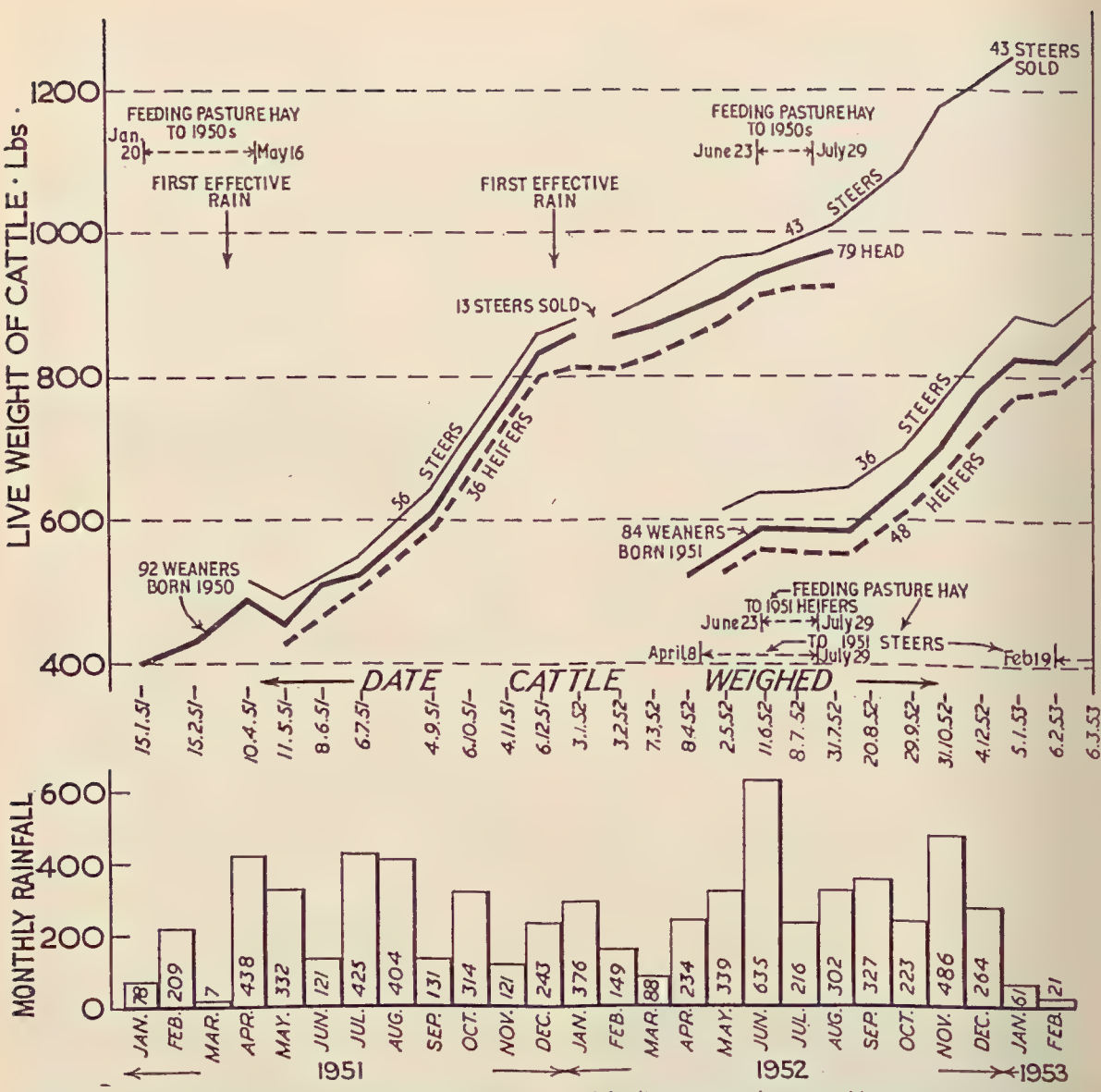

Fig. 3.—Growth curves of Aberdeen Angus cattle, periods of feeding pasture hay, monthly rainfall and incidence of first effective rainfall at "Blackwood", Penshurst.

Yards were enlarged and scales installed late in 1950 and weighing of calves dropped in June and July, 1950, commenced on January 5, 1951. The calves, 56 steers and 38 heifers, had not been individually branded with a serial number but had been ear notched in groups within a fortnight of birth.

The calves born each fortnight had been earmarked differently to correspond with the mating of the mothers to different bulls. The mothers were mated firstly in one herd to one bull and then divided into two herds and mated to four more different bulls at different times for consecutive periods of about two weeks each. As the calves were dropped they were earmarked on the 283rd day from the day that the different bulls were removed from each of the herds. It was assumed that in each of the groups a large proportion of the calves was by the particular sire. When more information is available, it will be used to show the influence of the different sires on their progeny.

The calves were born in a dry year, 1950, when the rainfall was only 1,789 points. The spring was sub-normal and there was some difference of opinion as to the quantity of feed available. Nevertheless, the calves had done well and were mostly good to prime when first weighed in January, 1951. November and December, 1950, and January, 1951, were dry months, with a total of 266 points of rain. In February, 209 points fell but with only 7 points in March the prospects of a good season were not bright. The weather broke early in April and a good season followed. The rainfall for 1951 was 2,823 points. Good early rains in January, 1952, with just sufficient in February and March kept the grass growing until the weather broke again in April and a good autumn was ensured. Heavy falls, totalling 635 points in June, fully saturated the soil which remained saturated until late spring. The total rainfall for 1952 was 3,639 points.

Two-year-old bullocks on winter pastures at "Blackwood".

When first weighed at "Blackwood" on January 5, 1951, the 1950 calves were running with their mothers. From the 20th January they were fed grass hay at the rate of one bale, about 58 lb. weight, to every three cows per day. This rate of feeding was continued until April 5, when they were weaned and grazed on a hay aftermath (the old cultivation paddock), which was regarded as having as good autumn feed on it as any paddock on the property. There they were fed grass hay at the rate of 2 bales per calf per month until May 16, when they were moved to the Green Hill paddock of 540 acres, which had good feed (grass) on it. Hay feeding was then discontinued. On September 4, the steers and heifers were drafted and grazed in separate herds, sometimes with sheep, but more often without.

On January 21, 1952, thirteen of the heavier steers were marketed. At "Blackwood" they weighed 950 lb. and after being killed a few days later the average chilled weight of their carcasses was 508 lb. These carcasses as seen from Table 2, appraised well and obtained an average score of 65·4 points under the New Zealand system.

The forty-three 1950-steers remaining at Blackwood had an average weight of 991 lb. on July 7, 1952, when half of them were prime and the other half very nearly so. The property was saturated with water from early June, but the grass was good. From June 23, to July 29, 1952, when feeding was discontinued because the paddocks were too wet for the vehicles carrying the hay, they were given 385 bales of grass hay. The hay was poor and had been damaged to some extent in the stack by rain. The average weight of the bales was 60 lb. By October 31 these steers were all prime and their average live weight had risen to 1,130 lb. During November they added 95 lb. to their live weight and another 27 lb. during December to average 1,247 lb. when weighed prior to despatch to market on January 5, 1953.

Twenty-two of these bullocks were sold by auction at Newmarket, and twenty-one were sold over the hooks to Messrs. Sims Cooper Pty. Ltd., Newport. When the bullocks were finally weighed at "Blackwood," alternate bullocks were drafted for Newmarket and Sims Cooper. The 22 drafted for Newmarket had an average live weight of 1,228 lb. and those for Messrs. Sims Cooper 1,267 lb.

At Newmarket, the agents drafted the 22 bullocks roughly according to size, into two pens of 11 each prior to sale on January 7, 1952. The larger bullocks made £47 per head. The smaller ones £46. The carcasses of the larger bullocks were not appraised, seven were killed on January 12, and three on January 15, and these ten averaged 740 lb. hot weight, equal to an estimated chilled weight of 721 lb. They varied from 688 to 853 lb. hot dressed weight. All trace of the eleventh bullock was lost. These cattle had been well fed on grass hay at the Melbourne abattoirs

while being held prior to slaughter, but this would not have maintained the weight of the bullocks.

The 11 smaller bullocks were purchased by Messrs. Wilson Bros., Sorrento. One of the bullocks was lost at Newmarket, and the other ten were appraised at Sorrento on January 17, after having been slaughtered the day before. These bullocks had been transported by road to Sorrento and held on dry and rather sparse pasture. It would be suspected that these bullocks had lost considerable weight somewhere between 15 and 20 lb. of dressed weight per head while being held prior to slaughter. The ten carcasses weighed averaged 660 lb., varying from 613 to 723 lb. chilled weight when weighed during appraisal. The carcasses appraised very well, scoring an average 70 points out of 100, but four of them were very much overfat. Three had the ideal covering of fat and the other three were on the fat side.

The 21 bullocks consigned to Messrs. Sims Cooper were slaughtered the day after arrival, having had time to cool down. They therefore lost a minimum of weight while being held for slaughter. They weighed 1,267 lb. at "Blackwood" and their carcasses weighed 742 lb. when hot three days later. On appraisal, the carcasses scored an average of 66 points. They lost points over those appraised at Sorrento through being fatter and heavier. Sims Cooper paid 128s. per 100 lb. chilled dressed weight for these bullocks. This worked out at £46 5s. per head. There are no selling charges when sold over the hooks.

These 1950 "Blackwood" bullocks had excellent muscle development, were short in the leg, and had well-developed hindquarters, in proportion to the fores. Many of the bullocks were too fat, eleven of the 31 appraised being very much so, scoring 5 points or less out of a maximum of 15 for back-fat thickness. Four of the carcasses had the ideal thickness of back fat. No carcass lost points for being on the thin side.

The 1950 heifers have done well and were mated on August 26 to one bull. Those which do not calve next winter will be slaughtered and their carcasses appraised. They had received 345 bales of grass hay from June 23 to July 29, 1952. Supplementary feeding ceased on July 29, because the paddocks were too wet to carry the vehicles carting it. Weighing of the heifers was discontinued after mating.

The 1951 Steers and Heifers

On April 8, 1952, 84 mixed nine-months-old weaners were weighed for the first time and averaged 530 lb. These weaners were all born before August 25, 1951, whereas the 1950 cattle were all dropped by July 28, 1950. The average birth date of the 1951 weaners is regarded as July 14, 1951.

The 1951 weaners were by five different bulls. The mothers had been run in two herds and mated for consecutive periods of 14 days with one or other of the five bulls. They were firebranded with a serial number within a fortnight of birth, and the numbers recorded to correspond with the bulls which were running with the mothers 283 days earlier.

The 1951 weaners did much better than the 1950 ones. After the first weighing on April 8, 1952, they were drafted for sex and have been run in separate paddocks since. The 36 steers were fed a supplementary ration of grass hay from weaning until July 29, when they had received a total of 454 bales. The 48 heifers were fed a supplementary ration of grass hay from June 23 to July 29, when they had received 340 bales. The grass in the paddocks was very good for the time of year, but was thoroughly saturated as the result of heavy rains in June, and remained saturated to the end of October.

The weighing sheds and yards at "Blackwood".

By October 31, 1952, the 1951 steers averaged

(continued on page 323)

Bacon-Pig Carcass Competition

Report by L. A. DOWNEY, H.D.A., Pig Expert, and A. D. NORTH, B.Agr.Sc.,
Live Stock Research Officer

Visitors studying award cards and exhibits on the display floor.

THE sixth annual Victorian bacon-pig carcass competition sponsored by the Australian Meat Board and conducted with the co-operation of the Victorian Department of Agriculture, terminated with a farmers' field day at the Dandenong Bacon Factory of the Gippsland Co-operative Bacon Curing Company on the 29th May, 1953.

The competition and field day again created great interest among farmers and people in the meat trade. There were 84 carcasses entered by 47 pig raisers, nine of whom had not previously participated in any pig carcass competition. Five of the 84 carcasses were disqualified for not being within the weight range of 120 lb. to 180 lb. as required by the conditions of the competition. The 79 carcasses scored the high average of 74·7 marks out of the possible 100. That is three marks higher than last year's average, and ten marks higher than in the first of these Meat Board Competitions held in Victoria in 1948.

First-class certificates of merit are awarded to entries scoring 70 or more marks. This year 82·3 per cent. of the competitors gained first-class certificates, compared with 62·8 per cent. in last year's competition.

The carcasses are judged for fullness of hams, lightness of shoulders, shortness of bone in legs, length of middle, abundance of lean and the correct amount of fat in the loin, and thickness and meatiness of the streak.

In each of those features, the average marks gained were higher than in last year's competition. (See Table 1.)

Several years ago it was common in pig carcass competitions to find a deficiency of lean meat and an excess of fat. However, this is not the case now. Most carcasses had an abundance of lean meat and few were too fat.

Messrs. D. (left), and G. L. Randall, with the uncut side of the first-prize winner.

Though competitive in nature, carcass competitions are mainly educational in purpose. One of the main objects of pig carcass competitions is to improve the quality of pig meat. This object has been achieved in this series of competitions.

It is relatively easy for a skilful pig raiser to improve his pigs from a score of less than 70 marks, but when he has achieved a score near 80, his scope for improvement is reduced, and he then requires skill plus a certain amount of good fortune.

The direct effect of pig carcass competitions in Victoria has been to improve the standard of carcasses in the competitions. Indirectly, the competitions have been a substantial force in the improvement of the average meat quality of the whole Victorian pig population in recent years.

Not only have competitors learned much from the carcass competitions and so improved their breeding stock and feeding methods, but their superior breeding stock have gone to other herds and their feeding practices have been copied by many other pig raisers, who have seen or been told about the results of carcass competitions.

Table 2 shows the details of the pigs and the marks they gained. It is important to realize that with such good overall results, the marks gained by an entry are more significant than its place in the competition.

It will be noticed that several breeds and crosses were represented by high scoring entries. This emphasizes the fact that no one breed has a monopoly of the characters associated with good quality in pig meat.

The 200 visitors who attended the prize-giving and field day at the bacon factory found much to interest them in the exhibition of the competition carcasses, each of which was cut and had its score card attached.

To help pig raisers gain the knowledge that pig carcass appraisal has taught, the writers gave a demonstration on the correlation of meat quality to the conformation

The loin section of Messrs. G. L. and D. Randall's winning carcass. This carcass from a Large White pig weighed 158 lb., and on appraisal scored as follows: Hams 7½ (possible 8); Shoulders 4½ (7); Streak 11 (12); Loin muscle thickness 21 (28); Backfat thickness 19 (20); Body length 16 (20); Leg length 5 (5). Total marks 84 out o possible 100.

of live pigs. This was done with the aid of selected carcass cuts, specially prepared drawings and life-size models of a prime prime bacon pig and its sectioned carcass.

Besides first-class and second-class certificates, the Australian Meat Board provided a trophy for the first prize-winner and twelve cash prizes. These were presented on behalf of the Board by its Pig Producers' Member, Mr. Frank Hawtin.

First Prize—£30 *and Canteen of Cutlery.*

G. L. and D. Randall, Box 27, Cohuna .. .. 84 points

Equal Second Prize—£14 5s. *each.*

J. E. Bruce, Narre Warren.. 83½ points

P. W. Clark and Son, Whittlesea .. .. 83½ points

W. C. Cruickshank, Jumbunna .. .. 83½ points

E. H. Ingle, Box 18, Yarram 83½ points

Sixth Prize—£9.

Coleman Bros., Cohuna .. 83 points

Seventh Prize—£7.

N. B. Osborne, Boho South, via Violet Town .. 82½ points

Eighth Prize—£6.

C. W. Colbert, Hunterston P.O., via Yarram .. 82 points

Equal Ninth Prize—£3 6s. 8d. *each.*

L. H. Castle, Bass Valley-road, Bena .. .. 81½ points

W. C. Cruickshank, Jumbunna .. .. 81½ points

A. W. and S. Williams, "Hill View," Weerite .. 81½ points

Equal Twelfth Prize—10s. *each.*

V. H. Ray, Hunterston P.O., via Yarram .. .. 81 points

Thomas and Taylor Pty. Ltd., Moutajup .. 81 points

Acknowledgment

The writers wish to express their appreciation of the assistance and facilities provided by the directors, management, and staff of the Gippsland Co-operative Bacon Curing Company in the conduct of the competition.

TABLE 1.—COMPARISON OF MARKS AWARDED EACH YEAR.

	Possible Points.	Average Points Gained.					
		1948.	1949.	1950.	1951.	1952.	1953.
By Inspection—							
Hams	8	4·7	5·3	4·6	5·1	5·4	5·8
Shoulders	7	4·0	4·7	4·4	4·6	4·6	4·7
Streak	12	7·2	5·7	9·1	8·5	9·2	9·7
By Measurement—							
Muscle at loin	28	18·3	16·4	18·9	17·8	19·8	20·6
Thickness of backfat	20	15·5	13·4	16·7	15·0	16·0	16·7
Length of body	20	12·3	15·4	11·4	13·9	14·8	15·0
Length of leg	5	2·7	2·3	2·6	2·1	1·9	2·2
Totals	100	64·7	63·2	67·7	67·0	71·7	74·7
Number of pigs 120–180 lb.	..	47	43	88	93	86	79
Average weight	..	160·5	158·0	161·0	147·3	149·5	149·4

TABLE 2.—BACON-PIG CARCASSES WHICH GAINED CERTIFICATES OF MERIT.

Name and Address of Exhibitor.	Breed of Pig.	Age at Slaughter (Days).	Carcass Weight (lb.).	Points Gained from Possible 100.
First Class Certificates.				
G. L. and D. Randall, Box 27, Cohuna	LW x LW	245	158	84
J. E. Bruce, "Sherwoods," Narre Warren	LW x LW	202	146	83½
P. W. Clark and Son, "Coodardy," Whittlesea	B x B	155	141	83½
W. E. Cruickshank, Jumbunna	B x T	213	147	83½
E. H. Ingle, Box 18, Yarram	WSB x (B x)	196	140	83½
Coleman Bros., Cohuna	B x B	181	163	83
N. B. Osborne, Boho South, via Violet Town	LW x LW	162	138	82½
C. W. Colbert, Hunterston P.O., via Yarram	B x (T x WSB)	181	157	82
L. H. Castle, Bass Valley-road, Bena	LW x LW	186	140	81½
W. E. Cruickshank, Jumbunna	B x T	213	147	81½
A. W. and S. Williams, "Hill View," Weerite	B x B	168	150	81½
V. H. Ray, Hunterston, via Yarram	B x (WSB x LW)	182	176	81
Thomas and Taylor, Pty. Ltd., Moutajup	LW x LW	195	134	81
C. F. Blake, Yinnar	LW x LW	135	124	80½
K. Cumming, "Braebrook," Molesworth	LW x LW	205	168	80½
A. W. and S. Williams, "Hill View," Weerite	B x B	168	142	80½
I. E. and F. Hawtin, "Rossmoyne," Colac West	LW x LW	174	138	79½
W. E. Ware, Jumbunna	B x B	209	159	79½
B. Whelpton, Whittlesea	B x B	165	159	79½
J. E. Bruce, "Sherwoods," Narre Warren	LW x LW	202	148	79
P. W. Clark and Son, "Coodardy," Whittlesea	B x B	155	152	79
Coleman Bros., Cohuna	B x B	181	146	79
I. E. and F. Hawtin, "Rossmoyne," Colac West	LW x LW	174	144	79
F. P. Myers, "Boongala," Bittern	LW x LW	148	139	79
W. A. Roy, Morrell's Hill, via Boolarra	B x B	185	125	79
W. E. Ware, Jumbunna	B x WSB	153	127	79
Fairchild and Clutterbuck, "Vaucluse," Tinamba	LW x LW	167	137	78½
B. J. Maslen, Somerville	LW x LW	202	156	78½
Thomas and Taylor Pty. Ltd., Moutajup	LW x LW	195	128	78½
J. M. Gardiner, "Wavelea," Ventnor	LW x LW	144	123	77½
C. A. Spiers, P.B., Echuca	LW x LW	186	147	77½
E. H. Ingle, Box 18, Yarram	WSB x (B x)	196	137	77
K. Cumming, "Braebrook," Molesworth	LW x LW	205	148	76½
N. B. Osborne, Boho South, via Violet Town	LW x LW	162	152	76½
B. E. Robinson, Pakenham Upper	LW x LW	174	146	76½
C. F. Blake, Yinnar	LW x LW	187	179	76
L. H. Castle, Bass Valley-road, Bena	LW x LW	189	165	76
A. D. Marshman, "Forgan," Archies Creek	LW x LW	202	168	76
G. L. P. Douglas, Box 18, Yarram	WSB x (B x)	216	174	75½
W. A. Roy, Morrell's Hill, via Boolarra	B x B	185	156	75½
T. H. Burdett, Sale-road, Yarram	B x (WSB x LB)	238	140	75
Fairchild and Clutterbuck, "Vaucluse," Tinamba	LW x LW	181	165	75
B. H. Taylor, "Wandeen Farm," Harkaway	LW x LW	214	167	75
L. F. Tyers, Bena	T x (T x)	242	173	75
V. H. Ray, Hunterston, via Yarram	B x (WSB x LW)	182	174	74½
C. McCullough, Warracknabeal	LW x (LW x T)	193	133	74½
F. W. and O. M. Hawtin, "Glen Due," Bena	T x T	203	158	74
C. A. Spiers, P.B., Echuca	LW x LW	186	169	74
J. E. Treacy, "White Acres," Gunbower	LB x LB	188	156	74
J. H. Craig, Yeoburn East, via Kerang	LW x B	178	146	73½
G. L. and D. Randall, Box 27, Cohuna	LW x LW	254	159	73½
B. H. Taylor, "Wandeen Farm," Harkaway	LW x LW	173	132	73½
J. H. Craig, Yeoburn East, via Kerang	LW x B	178	146	73
H. R. and G. R. Heard, Derrinallum	B x B	189	142	73
A. H. Richards, Dumbalk	LW x LW	198	177	73
W. Philmore, Box 70, Dimboola	LW x LW	248	171	72½
C. W. Colbert, Hunterston, via Yarram	B x (T x WSB)	181	156	72½
H. R. and G. R. Heard, Derrinallum	B x B	189	133	71½
W. R. Beechey, Pomborneit	B x B	171	150	71½
A. A. Craig, Yeoburn East, via Kerang	LW x LW	188	129	70½
D. A. Dobson, Samaria-road, Benalla	LW x LW	167	156	70½
A. C. Judd, Box 20, Yanac	B x LW	184	133	70½
Burdett, T. H., Sale-road, Yarram	B x (WSB x LB)	238	146	70
J. M. Gardiner, "Wavelea," Ventnor, Phillip Island	LW x LW	144	138	70
J. E. Treacy, "White Acres," Gunbower	LB x LB	186	142	70

TABLE 2.—BACON-PIG CARCASSES WHICH GAINED CERTIFICATES OF MERIT—*continued.*

Name and Address of Exhibitor.	Breed of Pig.	Age at Slaughter (Days).	Carcass Weight (lb.).	Points Gained from Possible 100.
Second Class Certificates.				
B. E. Robinson, Pakenham Upper	LW x LW	174	137	69½
D. A. Dobson, Samaria-road, Benalla	LW x LW	167	144	69
G. P. L. Douglas, Box 18, Yarram	WSB x (B x) ..	217	162	69
B. Whelpton, Whittlesea	B x B	153	177	69
B. J. Maslen, Somerville	LW x LW	202	150	68
Barklamb and Tyers, Welshpool	LW x WSB	200	170	67
A. H. Richards, Dumbalk	LW x LW	199	177	65
Salvation Army Farm and Training Centre, The Basin ..	LW x LW	194	141	64½
G. P. Cordner, Kangaroo Ground	LW x LW	164	148	63½
C. McCullough, Warracknabeal	LW x (LW x T) ..	193	131	63
F. P. Myers, "Boongala," Bittern	LW x LW	148	152	62½
Z. Jordan, Gerang Gerung	LW x LW	222	125	60½

NOTE.—LW denotes Large White; B denotes Berkshire; T denotes Tamworth; WSB denotes Wessex Saddleback; LB denotes Large Black.

BEEF CATTLE RESEARCH IN VICTORIA—(*continued from page 318*)

768 lb. and the heifers, 665 lb. Further gains have been recorded, and by March 6, 1953, the steers averaged 919 lb. and the heifers 834 lb. Supplementary feeding of the steers with hay was recommenced on February 19, 1953.

When 12-months-old in July, the 1951-steers were 89 lb. heavier and the 1951-heifers 54 lb. heavier than the corresponding 1950 animals. During the second year, the 1950 steers added 448 lb. and the 1950 heifers 441 lb. to their live weights. Details are shown in Table 3.

TABLE 3.—THE AVERAGE LIVE WEIGHTS OF 12 AND 24-MONTH-OLD STEERS AND HEIFERS IN MID-WINTER.

Date of Weighing.	July, 1951.	July, 1952.
	lb.	lb.
12-month old steers ..	543	632
12-month old heifers ..	503	557
24-month old steers ..	..	991
24-month old heifers ..	..	942

The growth curves, periods of feeding grass hay, incidence of effective autumn rains and monthly rainfall at "Blackwood" are shown in Figure 3. Separate growth curves for steers, heifers, and steers and heifers combined in each age group are shown. The growth curves follow a similar trend to those at Delatite, but, because of supplementary feeding with pasture hay, growth continued throughout the summer and the loss in weight following the first autumn rains was slight. At "Blackwood" the cattle are usually weighed during the first week of the calendar month.

This investigational work with beef cattle is continuing. Similar work is being carried out in South Australia (Beef Production Investigations at Hynam—Interim Reports by D. B. Muirhead and W. G. Allden, Journal of the Department of Agriculture of South Australia, February, 1952, and Beef Production Investigations at Tantanoola, same authors, same Journal, December, 1952), Western Australia; Tasmania (Beef Cattle Investigations at Glenora—First Interim Report by J. T. Bignell and G. K. Meldrum, Tasmanian Journal of Agriculture, November, 1952, and in New South Wales.

ACKNOWLEDGMENTS

The information in this report could not have been obtained without the help and co-operation of Mr. R. G. Ritchie and his staff at "Delatite" and by Mr. A. B. Ritchie and his staff at "Blackwood".

The carcass appraisals were carried out at the works of Messrs. Thos. Borthwick and Sons (Australasia), Brooklyn, Messrs. Sims Cooper (Freezing Works) Pty. Ltd., Newport, and by Messrs. Wilson Bros., Sorrento. Every facility was made available at these works for the appraisals.

Stock Foods and Stock Licks

BRANDS REGISTERED FOR 1953

By F. H. WILLIAMS, M.Sc., Deputy Chief Chemist

Stock foods and stock licks constitute some of the most important manufactured products used on the farm. Most farmers engaged in raising stock find it necessary at times to purchase stock food to supplement that naturally available, or stock lick to supply minerals lacking in the natural foods. It is essential that the quality of these manufactured foods and licks be maintained, and accordingly all of these materials offered for sale in Victoria must be registered annually with the Department of Agriculture, under the provisions of the Stock Foods Acts, and must comply at all times with these provisions. A list of registered brands is published each year. The 1953 list, published in the *Victoria Government Gazette* in May of this year, appears in this issue of the Journal.

The 1953 List

THE arrangement of stock foods and licks in convenient sections is similar to that of last year's list; the licks will be found towards the end of the list.

This year, a little over 450 brands have been registered, an increase of about 30 over last year. Much of this increase is due to the larger number of poultry foods; over 100 of these now appear. There has also been an appreciable rise in the number of stock licks.

The subject of "trace elements," both with regard to growth of pastures, crops, &c., and to animal nutrition, has received much attention over the past few years, and much investigational work regarding these elements is proceeding. Quite a number of stock licks now contain one or more of these elements, mostly copper and cobalt. Iodine has been a constituent of a number of licks for some years. But just as trace elements should not be added to soil unless found necessary, so they should not be fed to stock unless various symptoms shown by the stock indicate the need, or it is known that the district is one where such additions are necessary because of naturally-occurring deficiencies; even then, the use of licks is not necessarily the best means of combating such deficiencies.

With regard to vitamin oils, the feeding value of such oils is dependent on the vitamin content (A and/or D). A study of the figures supplied (International Units per gram) gives a ready method of comparing the values of different oils against the prices charged.

Requirements of the Acts

Registration is required of all mixed, concentrated, and prepared stock foods, by-products, and stock licks. Various details regarding distinguishing brand name, raw materials, and analysis must be supplied by the manufacturer or importer, who must effect the registration. In the published list, brand name, analysis, and name of manufacturer or importer are given. In the case of a stock food, the analytical figures given are the percentages of crude protein, fat, and fibre, except in the case of a vitamin oil, where vitamin content only is given. With bran and pollard, figures are not given, as these products must conform to the departmental standards given at the end of the bran and pollard section. With stock licks, the percentages of salt, phosphoric acid, lime, &c., must be stated.

Various standards are set for meat meals, blood meals, &c., and such materials must conform to these standards. These prescribed standards are set out in footnotes to the list.

When a stock food or lick is sold, the packet must contain a label giving the weight of the packet, and the other particulars as set out in the list.

Inspection of Stock Foods and Licks

In addition to registering stock foods and licks, the Department carries out regular inspections to see that the materials are labelled correctly, that their compositions conform with the details given on the labels, and that they comply with standards where such are prescribed. In recent months, particular attention has been paid to meat

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CERTIFIED PULLORUM-TESTED POULTRY FLOCKS

A certified Pullorum-tested Flock is one in which all stock over six months of age have given a negative reaction to the agglutination test for Pullorum Disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector, but it is not necessarily a guarantee of the type of birds in the flock.

The under-mentioned flocks have been certified by the Department of Agriculture, and will remain so for the current calendar year, or until such time as the Chief Veterinary Inspector determines.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Particulars of breeds of birds tested are as shown hereunder:—

A. Australorp; B. White Leghorn; C. Rhode Island Red; D. Sussex; E. Langshan; F. Brown Leghorn; G. Buff Orpington; H. Black Leghorn; I. Minorca; K. Legbar; L. Turkeys; M. New Hampshire; N. Plymouth Rock; O. Indian Game; P. Ancona; Q. Blue Leghorn.

Owner.	Breed.	Number of Birds.
Adlington, G. A., Maldon-road, Castlemaine	A, B	1,312
Anderson, G., Torbay-street, Macleod	A, B	1,387
Barnes, A., "The Heights," Blackburn	A, B, C	2,400
Barnett, W. H., 17 Brougham-street, Box Hill	A, B	549
Bayfield, A. E., Westall-road, Springvale	A, B, C	1,058
Bayfield Poultry Farm (J. E. Robinson), Bayfield-road, Bayswater	A	752
Boyce, A. D., Springvale-road, Forest Hill	A, B	1,455
Bray, J., 18 Hotham-street, Warrnambool	B	123
Casson, D., 20 Avoca-crescent, Pascoe Vale, W.8	A, B, C	1,299
Cook and McKnight, Lyons-road, North Croydon	A	2,326
Corbett Bros., Torbay-street, Macleod	A	2,647
Crawcour and Edmonds, Clarinda Poultry Farm, Centre-road, Clarinda	A, B, C	2,401
Crawcour and Edmonds, Mountain-road, Cockatoo	A, B	1,643
Cumming, H. D., Darlington ..	A, B	113
Davidson and O'Keefe's Hatchery (Mrs. G. Hocking), 22 Sherbrooke-avenue, Ringwood	A, B, C	664
Davies, L. F., Ireland-road, Spring Vale	B, C	2,581
Ellen, J., Rossmoyne Pig and Poultry Farm, Avoca	A, B	4,558
Ford, J. V., 11 Barker-avenue, Shepparton	A, B, C	990
Frost, M. C. (Mrs.), "Aralucn," Barwon Heads	A, B, C	1,003
Frye, I. H., Grimshaw-street, Watsonia	A	1,123
Fullerton, G. H., Long Gully, Bendigo	A, B	967
Gibbs, J., Highway Stud, Lower Plenty	A, B	914
Grenville, G. W., Grenville Stud Poultry Farm, Springvale-road, Spring Vale	A, B, C	3,051
Gwyther, R., Valley-road, Highton, via Geelong	A, B	1,265
Haigh-Lumby, J., Cranbourne-road, Frankston	A, B	622
Hanson, S. H., Box 7, Kilmore ..	A	43
Hayes Bros., Mt. Dandenong-road, Montrose	A, B	1,893
Hoffman, C. W., 5 Pearl-street, Horsham	A, B	2,985
Holder, G. E. and W., "Seven Acres," Fern Tree Gully	A	308
Hurst, B. H. G., New-street, Eltham	B	1,816
Johnson, M. (Mrs.), Ivanhoe Poultry Farm, Fern Tree Gully	A, B, C	2,147
Kenneally, W. R., Hampton Park ..	A, B	1,110
Kennedy, F., cr. Watson and Fern Tree Gully-roads, Glen Waverley	C	759
Kerr, J. J., Clarke-road, Spring Vale	A, B	3,126
Kostos Bros., Waverley-road, Oakleigh	A, B, C	2,904
Kroker, E., Horsham	B, C	742
Lambert, D. L. (Mrs.), Donald-road, Wheeler's Hill	B, C	92
McCabe, R., Gladstone-road, Dandenong	A, B	1,626
McCann, Ian R., Crowlands-road, Stawell	A, B	1,660
McGahy, Mary E. (Mrs.), Manningham-road, Doncaster	A, B, N, O	606
McKay, D., Landell's-road, Pascoe Vale	B, C	4,329
McLaren, A. D., Alexander-street, Mooroopna	A, B, C	1,248
McLister, K. C., 176 Hall-street, Spotswood	A, B, C	6,930
McLauchlan, D. F., Rossiter-road, Koo-wee-rup	A, B	1,392
McMahon, G. J., Burwood-road, Vermont	A, B, C	1,217
McQueen, R. J., Spring-road, Highett	C	517
Major, C. D., 59 Simpson's-road, Eaglehawk	A, B	3,232
Mason, David B., Montalbo-road, Ringwood	A, B	1,275
Maytime Stud and Hatchery (R. J. O'Brien), Watson's-road, Glen Waverley	C, D	525
Mills, J. J., Kilvinside-road, Noble Park	A, B, C	1,378
Milner, R. J., 59 Austin-crescent, Pascoe Vale, W.8	A, B, E, P, Q	2,585
Modra, L. H., 43 McCulloch-street, Nunawading	A, B	859
Morris, C. H., St. Clem's-road, Doncaster	A, B	524
Mudford, C. A., 15 Kirkwood-street, Eaglehawk, via Bendigo	A	1,005

CERTIFIED PULLORUM-TESTED POULTRY FLOCKS—*continued*

Owner.	Breed.	Number of Birds.
Musgrove, J., 16 Wellington-avenue, Blackburn	B	1,261
Myer Emporium ("Norman Lodge," Mt. Eliza)	A, B	2,320
Neale, S., Edward-street, Boronia ..	A, B	1,038
Nemet, P., Spring Vale-road, Spring Vale	A, B, C	3,456
Poulton, Alan W., Vickers-street, Sebastopol	A, B, C	2,156
Rae, John, 277 Albert-street, Sebastopol	A, B	1,835
Ridge and Son, Myrtle-grove, Blackburn	B, C, D	3,527
Ruskin Poultry Farm and Hatchery (A. McVay), Kernot-street, Spotswood, W.14	A, B	3,411
Ryan Bros., Junction-road, Blackburn	A, B	862
Sadler, S., 99 Baynes-street, Terang	A, B	810
Salmond, J. B., Deer Park ..	H, Q	100
Scales, J., and Son, West Wattle Tree-road, Boronia	A	2,263
Schulze, L. H., Torquay-road, Grovedale	A, B	1,749
Simpson, G. D., "Greenways," May-road, Glen Waverley	A, B	3,562
Smith, F., Lenham Stud Poultry Farm, Terang	A, B	2,123
Snodgrass, R., Pakenham East ..	A, B	1,366
Stephens, R., Reservoir-road, Kennington	A	1,835
Stewart, H. D., Marshall-street, Maryborough	C, K	417
Stewart, J. A., Maldon-road, Castlemaine	A, B	295
Stoneman, Campbell-road, Briar Hill	C, F	216
Streeter, H. A., Avoca	B	524
Swift, D. A., Kangaroo Flat ..	A, B	2,045
Taylor, H. L., 180 Surrey-road, Blackburn	A, B, M	288
Taylor, H. R., 119 Rathgown-street, Reservoir	A, B, C	1,941
Taylor, R. H., 132 Rathgown-street, Reservoir	A, B, C	3,874
Thomas, W. A., Springvale-road, Spring Vale South	A, B, C	1,093
Thomson, G., "Fortuna," Westall-road, Spring Vale	A, B	1,186
Trevallyn Poultry Farm (Tubb, F. H.), Sydney-road, Campbellfield	B, C	3,101
Waiting, T., Scoresby-road, Boronia	A, B	1,735
Waugh, A. J., Kangaroo Flat ..	A, B	856
Wohlers, S., Dooen-road, Horsham	A, C	385

STOCK FOODS AND STOCK LICKS—*(continued from page 324)*

and bone meals. These meals are not satisfactory if they contain large lumps of bone or other material, therefore the standard requires a prescribed degree of fineness, in addition to a minimum protein content. Several manufacturers have been proceeded against successfully for offering for sale meat and bone meals which departed markedly from the prescribed fineness standard.

The various provisions of the Acts and the prescribed standards are designed to ensure satisfactory stock foods and licks, and to protect the purchaser of such materials. Advice concerning any of the provisions of the Acts, or with regard to the chemical aspects of stock foods and licks, will be gladly supplied by the Chief Chemist, State Laboratories, Gisborne-street, Melbourne, C.2.

Is a simple arrangement that multiplies the power at the handle 260 times—handy to use, easy to move, quickly rigged, and works in roughest country. Standard equipment pulls trees and stumps from 1½ acres without changing anchor. Many other time- and labour-saving features. Catalogue with pleasure.

TREWHELLA BROS. PTY. LTD., TRENTHAM

LIST OF STOCK FOODS AND STOCK LICKS

REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE STOCK FOODS ACT 1936 (No. 4382) FOR THE YEAR 1953.

Distinguishing Brand Name.	Guaranteed Composition. Crude Protein (N x 6·25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	Manufacturer or Importer.
CONCENTRATED STOCK FOODS.	%	%	%	
* *Feeding Blood Meal.*				
Pannifex	75·0	2·0	5·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Champion Protein	75·0	..	5·0	Sims Cooper (Freezing Works) Pty. Ltd., 31 Queen-street, Melbourne
Brooklyn, T. B. and S. in diamond	75·0	1·5	1·0	Thos. Borthwick and Sons (A/asia) Ltd., 84 William-street, Melbourne
Portland, T. B. and S. in diamond	75·0	1·5	1·0	" " " " "
V.I.M.A.	75·0	1·0	1·0	Victorian Inland Meat Authority, 54 Market-street, Melbourne
M.C.C.	75·0	..	5·0	Melbourne City Council, Town Hall, Melbourne
† *Feeding Meat Meal.*				
M.C.C.	55·0	10·0	5·0	Melbourne City Council, Town Hall, Melbourne
Imperial Liver Meal	65·0	10·0	1·0	W. Angliss and Co. (Aust.) Pty. Ltd., Lynch-street, Footscray
Pannifex	55·0	5·0	3·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
V.I.M.A.	55·0	11·0	1·0	Victorian Inland Meat Authority, 54 Market-street, Melbourne
Champion Protein Liver Meal	60·0	20·0	5·0	Sims Cooper (Freezing Works) Pty. Ltd., 31 Queen-street, Melbourne
Fish Meal.				
Nar-Fis-Can Fish Meal	60·0	4·0	2·0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
‡ *Feeding Meat and Bone Meal.*				
V.I.M.A.	45·0	12·0	2·0	Victorian Inland Meat Authority, 54 Market-street, Melbourne
Mercury	45·0	12·0	1·5	Process Refiners Pty. Ltd., 582 Little Collins-street, Melbourne
Pannifex	45·0	5·0	5·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Imperial Protein	50·0	8·0	2·0	W. Angliss and Co. (Aust.) Pty. Ltd., Lynch-street, Footscray
Cal-Phoric	45·0	15·0	2·5	Mulgrave By-Products Co., North-road, East Oakleigh
Champion Protein	50·0	12·0	5·0	Sims Cooper (Freezing Works) Pty. Ltd., 31 Queen-street, Melbourne
T. B. and S. in diamond Brooklyn No. 1	50·0	12·0	4·0	Thos. Borthwick and Sons (A/asia) Ltd., 84 William-street, Melbourne
T. B. and S. in diamond Brooklyn No. 2	45·0	12·0	4·0	" " " " "
Dandy	45·0	12·0	1·66	Gippsland Co-op. Bacon Curing Co. Ltd., Dandenong
Pridham's	45·0	12·0	1·0	W. Pridham Pty. Ltd., Evans-street, Braybrook
Pennell's	50·0	6·0	4·0	G. W. Pennell, Burke-street, Braybrook
Ibis	45·0	10·0	3·0	Ficken, Halliday, and McClelland Pty. Ltd., 634 Bourke-street, Melbourne
M.S.C.	47·3	16·2	3·5	The Mildura Shire Council, Mildura
T. B. and S. in diamond Portland No. 1	50·0	12·0	4·0	Thos. Borthwick and Sons (A/asia) Ltd., 84 William-street, Melbourne
T. B and S. in diamond Portland No. 2	45·0	12·0	4·0	" " " " "
Pioneer	45·0	10·0	2·0	J. Cockbill Pty. Ltd., Footscray-road, Footscray
Corio	50·0	10·0	3·0	G. H. and S. Thomson and Co., 164 Moorabool-street, Geelong
Sayer	45·0	8·0	2·0	Sayer and Co. Incorporated, Laverton
Melvic	45·0	12·0	3·0	Southern Meat Works Pty. Ltd., 623 Collins-street, Melbourne
Bone and Meat Meal.				
Kitchen's	42·5	7·0	2·5	J. Kitchen and Sons Pty. Ltd., Ingles-street, Port Melbourne
Pannifex	40·0	5·0	5·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Apex	40·0	10·0	3·0	North-Eastern Bone Products, Wangaratta

* Standard not less than 75 per cent. crude protein and not more than 5 per cent. crude fibre.
† Standard not less than 55 per cent. crude protein and not more than 7 per cent. phosphoric acid. 100 per cent. must pass through a 10-mesh sieve.
‡ Standard not less than 45 per cent. crude protein. 100 per cent. must pass through a 10-mesh sieve.

Distinguishing Brand Name.	Guaranteed Composition. Crude Protein (N x 6·25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum	Manufacturer or Importer
CONCENTRATED STOCK FOODS *continued.*	%	%	%	
Milk Products.				
Krafco (Dried Whey)	10·0	0·5		Kraft Foods Ltd., Riverside-avenue, South Melbourne
Kraftone (Dried Whey)	10·0	0·5		" " " " " "
Lactokraft Milk Product	10·0	0·1		" " " " " "
Milway Milk Product	20·0	18·0	1·5	" " " " " "
Maffco Buttermilk Powder	30·0	5·0		Maffra Co-op. Milk Products Co. Ltd., Maffra
K.B.F. Buttermilk Powder	30·0	6·0		Korumburra and District Co-op. Butter Factory and Trading Co. Ltd., Korumburra
Buttermilk Powder	31·2	14·0		Warrnambool Cheese and Butter Factory Co. Ltd., Allansford
Colac Dried Milk Albumen	54·0	5·0	0·2	Colac Dairying Co. Ltd., Colac
Longbar Dried Skim Milk Powder	30·0	0·5		Longwarry and District Dairymen's Co-op. Association Ltd., Longwarry
Oil-Seed or Cake Meals and Nuts.				
Eta Peanut Meal	45·0	2·0	6·0	Nut Foods Pty. Ltd., 271–277 Grant-street, South Melbourne
Eta Coconut Meal	20·0	6·0	11·0	" " " " " "
Meggitt's Linseed Oil Meal	30·0	3·5	11·0	Meggitt Ltd., 41–45 Hobson's-road, South Kensington
Barnes' Linseed Oilmeal	33·0	2·0	10·0	D. E. Scanlan, Bank House, Bank-place, Melbourne
Barnes' Coconut Oilmeal	21·0	1·5	12·0	" " " " " "
MIXED STOCK FOODS.				
For Pigs.				
Barastoc Pig Cubes	15·0	3·0	6·0	Barastoc Products, 395 Collins-street, Melbourne
Osmond's Codlivine (Pigs)	20·0	15·0	9·0	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
Gem Pig Meal	15·0	3·0	5·0	Burrows Hume Flour Mills, 570 Young-street, Albury
Gem Pig Cubes	15·0	3·0	5·0	" " " " " "
Clark's Pig Starter	17·0	4·0	6·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Clark's Gro-Pig	16·0	3·0	4·0	" " " " " "
Hutmill Pig Meal	14·0	2·5	7·5	Hutmill Stock and Poultry Food Company, Hartington-street, Glenroy
Hutmill Pig Pellets	14·0	2·5	7·5	" " " " " "
Vet-N-Ary Pig Fattening Pellets*	15·0	3·0	6·0	Creamoata Ltd., Sunshine-road, West Footscray
Vet-N-Ary Pig Starter Pellets*	17·0	4·0	6·0	" " " " " "
Clark's Pig-Mycin¶	17·0	4·0	6·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Granary Pigmeal	10·0	3·0	10·0	C. R. Edgar and Co. Pty. Ltd., 34 Queen's-road, Melbourne
For Calves.				
Harper's Star Calf Food	12·0	2·5	10·0	Robert Harper and Co. Ltd., 133 Rouse-street, Port Melbourne
Parsons' Calf Food*	12·0	5·0	12·0	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Ward's Calf Food	9·0	3·0	7·0	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
Vetamac Calf Food	15·35	7·5	1·5	A. H. McDonald, 627–631 Bridge-road, Richmond
Clark's Gro-calf	20·0	4·0	4·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Kaf-o-vite	16·5	9·5	7·5	Goldsbrough, Mort, and Co. Ltd., 526 Bourke-street, Melbourne
Barastoc Calf Pellets	18·0	4·0	6·5	Barastoc Products, 395 Collins-street, Melbourne
Rudduck's Calf Meal	17·0	2·3	3·5	Rudduck and Co. Pty. Ltd., 556 Lonsdale-street, Melbourne
Hutmill Calf Food	13·0	4·0	10·0	Hutmill Stock and Poultry Food Company, Hartington-street, Glenroy
Hutmill Calf Pellets	13·0	4·0	10·0	" " " " " "
Vet-N-Ary Calf Pellets	17·0	4·0	7·0	Creamoata Ltd., Sunshine-road, West Footscray
Vet-N-Ary Calf Meal	17·0	4·0	7·0	" " " " " "
Calfmilk	19·0	5·0	5·0	British United Dairies Pty. Ltd., 33 King-street, Melbourne
A.B.C. Federal Calf Food	20·4	8·2	5·1	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, Melbourne
Competition Calf Meal	18·0	6·0	4·0	Poultrymen and Farmers Trading Co. Pty. Ltd., 276–286 Queensberry-street, North Melbourne
Vita-Lick Calf Meal	16·5	5·0	8·0	Goldsbrough, Mort, and Co. Ltd., 526 Bourke-street, Melbourne
Chief Calf Food	12·0	5·0	5·0	Werona Products, 592 Burwood-road, Hawthorn
Gem Calf Meal	20·0	4·0	4·5	Burrows Hume Flour Mills, 570 Young-street, Albury
Gem Calf Pellets	20·0	4·0	4·5	" " " " " "
McKenzie's Calf Food	10·0	5·0	6·0	J. P. McKenzie and Co. Pty. Ltd., 74 Queen's Bridge-street, South Melbourne

* Contains 1 per cent. salt. ¶ Contains antibiotic.

Distinguishing Brand Name.	Guaranteed Composition. Crude Protein (N x 6·25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	Manufacturer or Importer.
MIXED STOCK FOODS—*continued.*	%	%	%	
For Dairy Cows.				
Lambert's Dairy Mixture No. 2	15·0	5·0	10·0	H. V. and R. Towers, 696 High-street, East Kew
Barastoc Dairy Cow Cubes	15·0	3·0	10·5	Barastoc Products, 395 Collins-street, Melbourne
Barastoc Dairy Cow Meal	15·0	3·0	10·5	" " " " " "
Mormilk No. 2†	20·0	4·75	14·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Clark's Dairy-Mex	15·0	3·0	8·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Hutmill Dairy Meal	17·0	3·0	8·0	Hutmill Stock and Poultry Food Company, Hartington-street, Glenroy
Hutmill No. 2 Dairy Meal	14·5	3·0	9·0	" " " " " "
Vet-N-Ary Dairy Cowmeal No. 1*	15·0	3·5	14·0	Creamoata Ltd., Sunshine-road, West Footscray
Vet-N-Ary Dairy Cow Meal No. 2*	12·0	3·25	14·0	" " " " " "
Vet-N-Ary Dairy Cow Cubes No. 1*	12·0	3·25	14·0	" " " " " "
Vet-N-Ary Dairy Cow Cubes No. 2*	12·0	3·25	14·0	" " " " " "
Vet-N-Ary Cow Feed No. 1	9·0	2·5	18·0	" " " " " "
Vet-N-Ary Cow Feed No. 2	6·5	2·25	22·5	" " " " " "
Cohana Blended Cowfeed	11·0	2·5	7·0	Cohana Stockfood Co., Hammond-road, Dandenong
Hygrade Cowmeal	15·0	2·5	7·0	" " " " "
V.W.C. Cow Meal	14·0	3·0	7·0	Victorian Wheatgrowers' Corporation Ltd., 17 Queen-street, Melbourne
Competition Cow Meal	15·0	3·0	9·0	Poultrymen and Farmers Trading Co. Pty. Ltd., 276–286 Queensberry-street, North Melbourne
Granary Dairy Meal	10·0	3·0	10·0	C. R. Edgar and Co. Pty. Ltd., 34 Queen's-road, Melbourne
Chief Cow Meal	13·0	3·0	14·0	Werona Products, 592 Burwood-road, Hawthorn
Gem Dairy Meal	16·0	3·5	8·0	Burrows Hume Flour Mills, 570 Young-street, Albury
Gem Dairy Cubes	16·0	3·5	8·0	" " " " " "
For Sheep.				
Barastoc Sheep Cubes	14·5	3·0	9·0	Barastoc Products, 395 Collins-street, Melbourne
Barastoc Ewe and Lamb Cubes	18·0	3·0	8·0	" " " " " "
Vet-N-Ary Sheep Cubes No. 1	14·5	3·0	8·0	Creamoata Ltd., Sunshine-road, West Footscray
Vet-N-Ary Sheep Cubes No. 2*	12·5	3·0	8·0	" " " " " "
Vet-N-Ary Sheep Nuts	14·5	3·0	8·0	" " " " " "
Gem Sheep Cubes	13·5	3·0	8·0	Burrows Hume Flour Mills, 570 Young-street, Albury
General.				
Osmond's Codlivine for all stock	20·0	15·0	9·0	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
Purity Protein Meal	15·0	3·0	5·0	Wise Bros. Pty. Ltd., Tocumwal
Stock Mixture*	13·5	5·5	17·5	Parsons Brothers and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Parsons Cereal Stock Meal*	10·0	4·5	18·5	" " " " " "
V.W.C. Stock Meal	11·0	4·0	9·0	Victorian Wheatgrowers' Corporation Ltd., 17 Queen-street, Melbourne
Stock Meal	11·5	2·25	6·0	Creamoata Ltd., Sunshine-road, West Footscray
Protein Meal*	40·0	9·0	5·0	Wilcox Mofflin Limited, 34 King-street, Melbourne
Poultry Foods.				
Harper's Chicken Mixture	8·5	2·0	3·0	Robert Harper and Co. Ltd., 133 Rouse-street, Port Melbourne
Harper's Poultry Food	16·0	5·0	7·5	" " " " " "
McKenzie's Chicken Mixture	10·0	1·8	3·8	J. F. McKenzie and Co. Pty. Ltd., 74 Queen's Bridge-street, South Melbourne
Clark's Laymor	18·0	4·0	6·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Clark's Gro-Turk	20·0	4·0	5·0	" " " " " "
Clark's Gro-chick	17·0	4·0	5·0	" " " " " "
Clark's Vitamilk	38·0	8·0	2·0	" " " " " "
Clark's Cagena	15·0	4·0	6·0	" " " " " "
Clark's Eggoleen	38·0	8·0	2·0	" " " " " "
Clark's Chick-starter	20·0	4·0	5·0	" " " " " "
Clark's Turkey Starter	24·0	3·0	5·0	" " " " " "
Clark's Breeder Mash	17·0	4·0	6·0	" " " " " "
Clark's Broiler Feed	20·0	4·0	5·0	" " " " " "
Clark's Fatner	14·0	4·0	6·0	" " " " " "
Clark's Turkey-Mycin‡	24·0	3·0	5·0	" " " " "
Clark's Chick-Mycin‡	20·0	4·0	5·0	" " " " "
Warragul Laying Mash	17·0	5·5	6·4	Warragul Egg Circle, Warragul
Warragul Growing Mash	16·0	4·8	6·0	" " "

* Contains 1 per cent. of salt. † Contains 2 per cent. of salt. ‡ Contains antibiotic.

Distinguishing Brand Name.	Guaranteed Composition. Crude Protein (N x 6·25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	Manufacturer or Importer.
MIXED STOCK FOODS—*continued.*	%	%	%	
Poultry Foods—continued.				
Cowling's Laying Mash	14·0	2·5	7·0	W. Cowling, Market Square, Bendigo
Cowling's Growing Mash	15·0	2·5	7·0	" " " "
Cowling's Chick Starter	15·5	3·0	5·0	" " " "
Cowling's Growing Grain	9·5	1·5	5·0	" " " "
Barastoc Chick Pellets	19·0	4·5	6·0	Barastoc Products, 395 Collins-street, Melbourne
Barastoc Special Chick Pellets‡	19·0	4·5	6·0	" " " " " "
Barastoc Poultry Growers' Pellets	15·0	4·0	7·0	" " " " " "
Barastoc Poultry Growers' Pellets W	15·0	4·0	7·0	" " " " " "
Barastoc Poultry Layers' Pellets	17·0	4·0	7·0	" " " " " "
Barastoc Poultry Layers' Pellets W	17·0	4·0	7·0	" " " " " "
Barastoc Poultry Layers' Mash	17·0	4·0	7·0	" " " " " "
Barastoc Poultry Breeders' Pellets	18·0	4·0	7·0	" " " " " "
Barastoc Turkey Starter Pellets	24·0	4·5	7·0	" " " " " "
Ward's Chick Meal	10·0	4·0	5·0	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
Osmond's Codlivine for Poultry	20·0	15·0	9·0	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
Excello Laying Mash	13·0	4·0	7·0	Lyall and Sons Pty. Ltd., 39–51 Leveson-street, North Melbourne
Lambert's Chicken Starter	17·0	4·0	6·0	H. V. and R. Towers, 696 High-street, East Kew
Lambert's Laying Mash	17·0	4·0	6·0	" " "
A.B.C. Growing Mash	14·0	4·0	5·3	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
A.B.C. Laying Mash	16·0	3·5	7·0	" " " "
Marvel Laying Mash	15·0	2·4	6·0	J. McBeth, 207 Neerim-road, Carnegie
Marvel Growing Mash	16·0	4·0	6·0	" " " "
Par-Meal Laying Mash†	13·5	4·0	11·5	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Parsons' Chicken Food	9·0	1·5	4·0	" " " "
Gem Breeders Pellets	17·0	4·0	7·0	Burrows Hume Flour Mills, 570 Young-street, Albury
Gem Fattening Pellets	18·0	4·0	7·0	" " " " " "
Gem Growing Pellets	20·0	4·5	6·0	" " " " " "
Gem Laying Mash	16·0	4·0	7·0	" " " " " "
Gem Laying Pellets	16·0	4·0	7·0	" " " " " "
Gem Growing Mash	20·0	4·5	6·0	" " " " " "
Gem Chicken Starter	20·0	4·0	6·0	" " " " " "
Gem Chicken Pellets	20·0	4·0	6·0	" " " " " "
Gem Turkey Starter	22·0	4·0	7·0	" " " " " "
Gem Turkey Fattener	18·0	4·5	7·0	" " " " " "
Pannifex Poultry Pusher*	32·0	7·0	8·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
V.W.C. Laying Mash	16·0	4·0	7·0	Victorian Wheatgrowers' Corporation Ltd., 17 Queen-street, Melbourne
V.W.C. Chick Starter	16·0	4·0	7·0	" " " " " "
V.W.C. Growing Grain	9·25	1·6	3·0	" " " " " "
V.W.C. Layers Pellets	16·0	4·0	7·0	" " " " " "
V.W.C. Growers Pellets	14·0	4·0	7·0	" " " " " "
V.W.C. Chick Pellets	16·0	4·0	7·0	" " " " " "
V.W.C. Antibio Chick Pellets*	16·0	4·0	7·0	" " " " " "
V.W.C. Antibio Chick Starter*	16·0	4·0	7·0	" " " " " "
Hutmill Growing Mash	16·0	3·0	7·0	Hutmill Stock and Poultry Food Company, Hartington-street, Glenroy
Hutmill Laying Mash†	17·0	3·0	7·0	" " " " " "
Hutmill Growers Pellets	16·0	3·0	7·0	" " " " " "
Hutmill Layers Pellets†	17·0	3·0	7·0	" " " " " "
Hutmill Chicken Mixture	10·0	2·4	2·0	" " " " " "
Hutmill Growing Grain	10·0	2·4	2·0	" " " " " "
Hutmill Chicken Mash	18·0	4·0	7·0	" " " " " "
Hutmill Special Chicken Mash‡	18·0	4·0	7·0	" " " " " "
Hutmill Special Chicken Pellets‡	18·0	4·0	7·0	" " " " " "
Hutmill Chicken Pellets	18·0	4·0	7·0	" " " " " "
Bush's Laying Mash	14·9	3·9	7·2	Albert Bush, Williamson-street, Bendigo
Bush's Chick Mash	15·4	3·6	6·9	" " "
J. Chick Grain	11·0	2·5	3·0	O. W. Jochinke Pty. Ltd., Wimmera-street, Dimboola
Vet-N-Ary Layers Pellets E	16·0	5·0	7·0	Creamoata Ltd., Sunshine-road, West Footscray
Vet-N-Ary Layer Mash	17·0	4·0	7·0	" " " " " "
Vet-N-Ary Turkey Fattening Pellets	18·0	4·5	7·0	" " " " " "
Vet-N-Ary Turkey Starter Pellets	22·0	4·5	7·0	" " " " " "
Vet-N-Ary Layers Pellets	17·0	4·0	7·0	" " " " " "
Vet-N-Ary Growers Pellets	14·5	4·0	7·0	" " " " " "
Vet-N-Ary Chick Pellets	17·0	4·5	7·0	" " " " " "
Vet-N-Ary Special Anti-biotic Chick Mash‡	18·0	4·5	7·0	" " " " " "
Vet-N-Ary Special Anti-biotic Chick Pellets‡	18·0	4·5	7·0	" " " " " "
Vet-N-Ary Breeder Pellets	17·0	4·0	7·0	" " " " " "
Vet-N-Ary Turkey Pellets	22·0	4·5	7·0	" " " " " "
Vet-N-Ary Cockerel Fattening Pellets	18·0	4·5	7·0	" " " " " "
Master Mix Chick Mash	15·0	3·5	5·0	Northern Seed Supply Co., Market-square, Bendigo
Master Mix Mash	15·0	3·5	5·0	" " " " " "

* Contains 2 per cent. of salt. † Contains 1 per cent of salt. ‡ Contains antibiotic.

Distinguishing Brand Name.	Guaranteed Composition. Crude Protein (N x 6·25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	Manufacturer or Importer.
MIXED STOCK FOODS—*continued.*	%	%	%	
Poultry Foods—continued.				
Burrows Chicken Mixture	10·0	2·0	4·0	Burrows Hume Flour Mills, 570 Young-street, Albury
P. and F. Special Chick Mixture	15·0	4·0	6·5	Poultrymen and Farmers Trading Co. Pty. Ltd., 276–286 Queensberry-street, North Melbourne
Competition Laying Mash	17·0	4·5	7·0	" " " " " "
Competition Growing Mash	15·0	4·0	5·5	" " " " " "
Competition Laying Pellets	17·0	4·5	7·0	" " " " " "
Competition Chick Pellets	16·0	4·0	7·0	" " " " " "
Competition Growing Pellets	15·0	4·0	6·0	" " " " " "
Cohana Blended Poultry Food	15·0	2·5	4·5	Cohana Stockfood Co., Hammond-road, Dandenong
Cohana Chicken Pellets	17·0	4·0	7·0	" " " " " "
Cohana Layer Pellets	16·0	3·0	5·0	" " " " " "
Cohana Grower Pellets	15·0	3·0	5·0	" " " " " "
Sirdar Chick Food	9·2	1·4	2·3	John MacLeod and Co. Pty. Ltd., 120-122 Lydiard-street, Ballarat
Chief Laying Mash	15·0	4·0	7·0	Werona Products, 592 Burwood-road, Hawthorn
WHEAT AND WHEAT BY-PRODUCTS.				
Lyall's Wheat Meal	9·0	3·0	4·0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Clark's Wheat Meal	9·0	1·0	3·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Maryborough Crushed Wheat	9·5	2·0	2·5	Maryborough Flour Mills Pty. Ltd., Maryborough
Wangaratta Crushed Wheat	8·5	1·5	2·5	Wangaratta Flour Mills Co. Pty. Ltd., Wangaratta
Water Wheel Stock Meal	9·5	1·5	2·5	Water Wheel Flour Mills Pty. Ltd., 83 William-street, Melbourne
Darling's Wheat Meal	10·5	2·5	3·5	John Darling and Son, 44 King-street, Melbourne
Garden City Stock Meal	9·6	1·5	2·5	Garden City Flour Mill, Ballarat
Kimpton's Crushed Wheat	8·0	1·5	3·0	W. S. Kimpton and Sons, 395 Collins-street, Melbourne
McLennan's Stock Wheat Meal	8·5	1·5	3·0	McLennan and Co. Pty. Ltd., Mooroopna
Willis' Wheat Stock Feed	10·0	1·9	2·2	Willis Bros., Kyneton
Minifie's Ground Wheat	9·0	1·5	3·0	Jas. Minifie and Co. Pty. Ltd., 422 Collins-street, Melbourne
Stratton's Wheat Meal	9·5	2·0	3·0	Stratton and Co. Pty. Ltd., 68 Lulie-street, Abbotsford
Cowling's Ground Wheat	9·5	2·0	2·5	W. Cowling, Market-square, Bendigo
Noske Crushed Wheat	9·5	2·0	2·5	Noske Flour Mills Pty. Ltd., 108 Queen-street, Melbourne
Thomas' Crushed Wheat	9·5	2·0	2·5	W. C. Thomas and Sons Pty. Ltd., 55 William-street, Melbourne
Co. Dair Wheatmeal	9·5	2·0	2·5	Co. Dair Products (Geelong) Ltd., Ryrie-street, Geelong
Hutmill Wheat Meal	9·5	2·0	2·5	Hutmill Stock and Poultry Food Company, Hartington-street, Glenroy
Hutmill Rolled Wheat	9·5	2·0	2·5	" " " " " "
Gem Stock Meal	9·0	2·0	3·5	Burrows Hume Flour Mills, 570 Young-street, Albury
Towers' Wheat Meal	8·5	1·5	2·5	H. V. and R. Towers, 696 High-street, East Kew
Williams' Rolled Wheat	9·5	2·0	2·5	Henry E. Williams and Sons Pty. Ltd., 3–9 High-street, Maryborough
Williams' Wheat Meal	9·5	2·0	2·5	" " " " " "
Moregrain Wheat Meal	9·0	3·0	4·0	Norris and Wilkinson, Tinning-street, Brunswick
Marvel Wheat Meal	9·5	2·0	3·5	J. McBeth, 207 Neerim-road, Carnegie
Grant and Wilson Crushed Wheat	8·5	1·5	2·5	Grant and Wilson, Yarrawonga
Tomlins Simmie Ground Wheat	9·5	2·0	2·5	Tomlins Simmie and Co., Bendigo
Tyner's Ground Wheat	9·5	1·5	2·5	W. Tyner Pty. Ltd., 623 Collins-street, Melbourne
V.W.C. Crushed Wheat	9·5	1·5	3·0	Victorian Wheatgrowers Corporation Ltd., 17 Queen-street, Melbourne
V.W.C. Wheatmeal	9·5	1·5	3·0	" " " " "
Echuca Crushed Wheat	9·0	1·5	3·5	Echuca Flour Mills Pty. Ltd., Echuca
Crushed Wheat	9·5	1·5	2·5	North-Eastern Co-op. Soc. Ltd., Wangaratta
Crushed Wheat	9·5	1·5	3·5	British United Dairies Pty. Ltd., 33–35 King-street, Melbourne
Malcolm's Crushed Wheat	9·5	2·0	3·0	James Malcolm and Co. Pty. Ltd., St. Arnaud
Kerang Crushed Wheat	9·5	2·0	2·5	Kerang Flour Milling Co. Pty. Ltd., Kerang
Bush's Crushed Wheat	9·5	1·5	3·0	Albert Bush, Williamson-street, Bendigo
Bush's Ground Wheat	9·5	1·5	3·0	" " " " " "
P. and F. Wheatmeal	9·5	2·0	3·0	Poultrymen and Farmers Trading Co. Pty. Ltd., 276–286 Queensberry-street, North Melbourne
Cohana Wheatmeal	9·5	2·0	2·5	Cohana Stockfood Co., Hammond-road, Dandenong
Cohana Crushed Wheat	9·5	2·0	2·5	" " " " " "
Pratt's Ground Wheat	9·5	1·5	3·5	David Pratt and Sons, 215-221 Mair-street, Ballarat
Crushed Wheat	9·0	1·5	2·5	Burnley Flour Mills Pty. Ltd., 376 Swan-street, Burnley
Vet-N-Ary Crushed Wheat	9·5	1·5	3·0	Creamoata Ltd., Sunshine-road, West Footscray
No. 1 Rolled Wheat	8·5	1·5	2·5	Cromarty Animal Food Mill, Springvale-road, Springvale South
Polplus	9·0	2·0	2·0	" " " " " "
Bransum	10·0	2·0	3·5	" " " " " "
Granary Wheatmeal	9·0	2·0	3·0	C. R. Edgar and Co. Pty. Ltd., 34 Queen's-road Melbourne
Permewan's Wheatmeal	9·5	1·5	3·0	Permewan Wright Ltd., Noble Park

Distinguishing Brand Name.	Guaranteed Composition. Crude Protein (N x 6·25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	Manufacturer or Importer.
BRAN AND POLLARD.	%	%	%	
The following firms have registered distinguishing brand names for Bran† and Pollard‡ :—				
T. Brunton and Co. Pty. Ltd. ..	..	..	..	531 Collins-street, Melbourne
Burnley Flour Mills Pty. Ltd. ..	..	..	..	376 Swan-street, Burnley
Darling (John) and Son	..	..	..	44 King-street, Melbourne
Echuca Flour Mills Pty. Ltd. ..	..	..	..	Echuca
Garden City Flour Mill	..	..	..	Trench-street, Ballarat
Grant and Wilson	..	..	..	McNally-street, Yarrawonga
Kimpton (W. S.) and Sons	..	..	..	395 Collins-street, Melbourne
Maryborough Flour Mills Pty. Ltd. ..	..	..	..	Maryborough
McLennan and Co. Pty. Ltd. ..	..	..	..	Mooroopna
Miniffe (James) and Co. Pty. Ltd. ..	..	..	..	422 Collins-street, Melbourne
Noske Flour Mills Pty. Ltd. ..	..	..	..	108 Queen-street, Melbourne
Schutt and Barrie Flour Mills Pty. Ltd.	..	..	..	Geelong-road, West Footscray
Silver Lake Flour Mill Pty. Ltd. ..	..	..	..	Sale
Smith (W. and P.)	..	..	..	35 Cusack-street, Wangaratta
Stratton and Co. Pty. Ltd. ..	..	..	..	Lulie-street, Abbotsford
Swan Milling Co.	..	..	..	Swan Hill
Thomas (W. C.) and Sons Pty. Ltd. ..	..	..	..	55 William-street, Melbourne
Tomlins Simmie and Co.	..	..	..	87 Charleston-road, Bendigo
Wangaratta Flour Mills Co. Pty. Ltd.	..	..	..	Wangaratta
Willis Bros.	..	..	..	Kyneton
Wimmera Flour Mill Co. Pty. Ltd. ..	..	..	..	Stawell
Water Wheel Flour Mills Pty. Ltd. ..	..	..	..	83 William-street, Melbourne
Wise Bros. Pty. Ltd.	..	..	..	Tocumwal
Howard Jackett and Co. Pty. Ltd. ..	..	..	..	534 Bridge-road, Richmond
Robert Hutchinson Ltd.	..	..	..	Glenroy
Burrows Hume Flour Mills ..	..	..	..	Albury
Corowa Milling Co. Ltd.	..	..	..	Corowa
Co. Dair Products (Geelong) Ltd. ..	..	..	..	Ryrie-street, Geelong
Elmore Flour Mills Pty. Ltd. ..	..	..	..	Elmore
James Malcolm and Co. Pty. Ltd. ..	..	..	..	St. Arnaud
Kerang Flour Milling Co. Pty. Ltd. ..	..	..	..	Kerang
Creamoata Limited	..	..	..	Sunshine-road, West Footscray
† The 1953 Chemical Standard for Bran is	14·0	2·5	10·0	
‡ The 1953 Chemical Standard for Pollard is	14·0	3·0	6·25	
OAT PRODUCTS.				
Parsons' No. 1 Oat Branning	9·0	6·75	16·0	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Parsons' No. 2 Oat Branning	7·5	5·75	15·25	" " " " " "
Ward's Oat Branning	6·0	4·0	25·0	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
McKenzie's Oat Branning	7·0	4·0	20·0	J. F. McKenzie and Co. Pty. Ltd., 74 Queen's Bridge-street, South Melbourne
McKenzie's Oat Pollard	10·0	8·0	5·0	" " " " " "
McKenzie's Chicken Oats	6·0	5·0	4·5	" " " " " "
Granary Ground Oats	8·0	4·0	14·0	C. R. Edgar and Co. Pty. Ltd., 34 Queen's-road, Melbourne
Vet-N-Ary Oat Feed	5·0	3·0	25·0	Creamoata Limited, Sunshine-road, West Footscray
Parsons' No. 2 Oat Screenings	8·5	5·5	13·25	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Parsons' No. 3 Oat Screenings	7·0	5·0	21·25	" " " " " "
Lyall's Oat Pollard	10·0	7·0	7·0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
A.B.C. Oat Brannings	6·0	4·0	25·0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
Garden City Crushed Oats	10·7	6·5	11·5	Garden City Flour Mill, Ballarat
Crushed Oats	8·0	3·0	3·5	North-Eastern Co-op. Soc. Ltd., Wangaratta
Crushed Oats	10·0	4·5	11·5	British United Dairies Pty. Ltd., 33–35 King-street, Melbourne
Echuca Crushed Oats	8·0	5·5	14·0	Echuca Flour Mills Pty. Ltd., Echuca
Malcolm's Crushed Oats	7·5	4·0	18·0	James Malcolm and Co. Pty. Ltd., St. Arnaud
Lyall's Oat Bran	9·4	4·5	13·7	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Lyall's Oat Brannings	4·8	3·2	25·7	" " " " " "
Harper's Provender	6·0	4·0	22·0	Robert Harper and Co. Ltd., 133 Rouse-street, Port Melbourne
Hutmill Crushed Oats	9·0	4·0	12·0	Hutmill Stock and Poultry Food Co., Hartington-street, Glenroy
Hutmill Ground Oats	9·0	4·0	12·0	" " " " " "
Cohana Crushed Oats	10·0	4·0	7·0	Cohana Stockfood Co., Hammond-road, Dandenong
Cohana Ground Oats	10·0	4·0	7·0	" " " " " "
P. and F. Oaten Meal	9·5	5·0	3·5	Poultrymen and Farmers Trading Co. Pty. Ltd. 276–286 Queensberry-street, North Melbourne
Permewan's Crushed Oats	10·3	4·0	10·0	Permewan Wright Ltd., Noble Park

Distinguishing Brand Name.	Guaranteed Composition.			Manufacturer or Importer.
	Crude Protein (N x 6·25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	
	%	%	%	
BARLEY PRODUCTS.				
Harper's Star Barley Meal	10·0	7·0	9·5	Robert Harper and Co. Ltd., 133 Rouse-street, Port Melbourne
Ward's Barley Meal	10·0	4·0	10·0	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
Lyall's Barley Meal	10·0	2·0	5·0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
McKenzie's Barley Pollard	12·0	3·0	20·0	J. F. McKenzie and Co. Pty. Ltd., 74 Queen's Bridge-street, South Melbourne
Parsons' Barley Meal	10·0	2·0	9·0	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
P. and F. Barley Meal	9·0	2·0	5·0	Poultrymen and Farmers Trading Co. Pty. Ltd., 276–286 Queensberry-street, North Melbourne
Pratt's Ground Barley	7·0	1·0	7·0	David Pratt and Sons, 215–221 Mair-street, Ballarat
Kelric No. 1 (Dried Distillers' Grains)	27·0	9·0	11·0	K. B. Stock Food Co. Pty. Ltd., 36 Wellington-street Collingwood
Kelric No. 2 (Dried Brewers' Grains)	18·0	4·0	17·0	" " " " " "
RICE PRODUCTS.				
Harper's Star Brown Rice Meal	12·0	12·0	12·0	Robert Harper and Co. Ltd., 133 Rouse-street, Port Melbourne
Parsons' Rice Meal	8·5	7·0	2·0	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
McKenzie's Rice Pollard	10·0	15·0	8·0	J. F. McKenzie and Co. Pty. Ltd., 74 Queen's Bridge-street, South Melbourne
MAIZE PRODUCTS.				
Polly Gluten Feed	18·0	3·0	9·0	Maize Products Pty. Ltd., corner Parker and Maribyrnong streets, Footscray
Maize Oil Meal	16·0	12·0	10·0	" " " "
Ward's Maize Meal	7·0	3·0	4·0	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
Lyall's Maize Meal	9·0	3·0	2·0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Clark's Maize Meal	9·0	3·0	3·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
V.W.C. Maize Meal	9·0	3·0	2·0	Victorian Wheatgrowers Corporation Ltd., 17 Queen-street, Melbourne
Marvel Maize Meal	8·0	3·0	4·0	J. McBeth, 207 Neerim-road, Carnegie
Hutmill Maize Meal	9·0	3·0	4·0	Hutmill Stock and Poultry Food Company, Hartington-street, Glenroy
Pratt's Ground Maize	7·0	2·0	3·5	David Pratt and Sons, 215–221 Mair-street, Ballarat
P. and F. Maize Meal	9·0	4·0	3·0	Poultrymen and Farmers Trading Co. Pty. Ltd., 276–286 Queensberry-street, North Melbourne
A.B.C. Maize Meal	7·0	3·0	4·0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
Creamo Maize Meal	9·0	3·0	2·0	Cromarty Animal Food Mill, Springvale-road, Springvale South
PEA PRODUCTS.				
Parsons' Pea Meal	16·0	1·5	18·75	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Parsons' Pea Screenings	16·25	1·0	6·0	" " " "
Ward's Pea Meal	14·0	1·0	18·0	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
Harper's Split Pea Screenings	8·5	1·2	37·5	Robert Harper and Co. Ltd., 133 Rouse-street, Port Melbourne
McKenzie's Pea Pollard	20·0	1·0	10·0	J. F. McKenzie and Co. Pty. Ltd., 74 Queen's Bridge-street, South Melbourne
P. and F. Pea Meal	20·0	1·0	6·0	Poultrymen and Farmers Trading Co. Pty. Ltd., 276–286 Queensberry-street, North Melbourne
HULLS.				
Parsons' Barley Hulls	2·5	0·6	39·75	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Harper's Barley Hulls	6·0	2·0	25·0	Robert Harper and Co. Ltd., 133 Rouse-street, Port Melbourne
Ward's Barley Hulls	2·0	0·8	32·0	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
McKenzie's Pea Hulls	6·0	0·5	40·0	J. F. McKenzie and Co. Pty. Ltd., 74 Queen's Bridge-street, South Melbourne
Parsons' Pea Hulls	3·5	0·4	46·25	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Ward's Pea Hulls	5·0	0·25	40·0	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne

Guaranteed Composition.

Distinguishing Brand Name.	Crude Protein (N x 6·25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	Manufacturer or Importer
HULLS—*continued.*	%	%	%	
Parsons' Oat Hulls (A)	1·25	0·4	40·75	Parsons Bros. and Co. Pty. Ltd., 554-562 Flinders-lane, Melbourne
Parsons' Oat Hulls (B)	4·25	3·0	30·0	" " " " " "
Parsons' Oat Hulls (C)	5·0	1·25	34·0	" " " " " "
Ward's Oat Hulls	1·5	0·7	35·0	H. S. K. Ward Pty. Ltd., 24-38 Spencer-street, Melbourne
Harper's Oat Hulls	3·0	1·0	35·0	Robert Harper and Co. Ltd., 133 Rouse-street, Port Melbourne
A.B.C. Oat Hulls	1·5	0·7	35·0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
Lyall's Oat Hulls	2·0	1·0	35·0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
McKenzie's Oat Hulls	1·5	1·0	35·0	J. F. McKenzie and Co. Pty. Ltd., 74 Queen's Bridge-street, South Melbourne
Creamoata Oat Hulls	2·0	1·0	32·5	Creamoata Ltd., Sunshine-road, West Footscray
MISCELLANEOUS.				
Lucerne Meal	13·0	3·0	25·0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Biscuit Sweepings	2·0	2·0	2·0	Swallow and Ariell Ltd., 60 Stokes-street, Port Melbourne
Bakehouse Sweepings	2·0	2·0	2·0	" " " " " "
F.P.C. Flax Meal	16·0	14·0	15·0	Flax Production Committee, 301 Flinders-lane, Melbourne
F.P.C. Crushed Flax Chaff	11·0	6·0	28·0	" " " " " "
Barley and Oat Pollard	11·0	1·0	10·0	Parsons Bros. and Co. Pty. Ltd., 554-562 Flinders-lane, Melbourne
P.M.F.*	13·0	2·0	4·0	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
C.P.K. Whale Solubles Protein	42·5	1·58	..	C. P. Kigler and Co., 151 Cathedral-street, Sydney, New South Wales

VITAMIN OILS.

Distinguishing Brand Name.	Guaranteed Composition. (In International Units per gram.)		Manufacturer or Importer.
	Vitamin A. (Minimum.)	Vitamin D. (Minimum.)	
Solvitax Cod Liver Oil	1,000	100	G. P. Embleton and Co. Pty. Ltd., 208 Little Lonsdale-street, Melbourne
Atlantic Unicod Emulsion Vitaminized Blending Feeding Oil	1,000	100	Atlantic Union Oil Co. Ltd., 396 Collins-street, Melbourne
Vetemul Blue Label Vitaminized Emulsion	5,000	Nil	Nicholas Pty. Ltd., 37 Swanston-street, Melbourne
Vetemul Green Label Vitaminized Emulsion	5,000	500	" " " " " "
Vetemul Brown Label Vitaminized Emulsion	1,000	100	" " " " " "
Apsolene	5,000	Nil	Australian Packers' Corporation Pty. Ltd., 414 Collins-street, Melbourne
Apsolene 2,500 A.D.	2,500	250	" " " " " "
Apsolene A.D.	5,000	500	" " " " " "
Ocean Gold A	5,000	Nil	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Ocean Gold A and D3	5,000	500	" " " " " "
Deaol	1,000	400	Australian Packers' Corporation Pty. Ltd., 414 Collins-street, Melbourne
Seaol	1,000	100	" " " " " "
Avol A	5,000	Nil	Australian Vitamin Oils Pty. Ltd., 456 Flinders-lane Melbourne
Avol A and D3	5,000	500	" " " " " "
Ovadol	5,000	500	F. H. Faulding and Co. Ltd., 123 Lonsdale-street, Melbourne
D and A Emulsion	5,000	500	Palmers Pastoral Products, 55 The Crescent, Ascot Vale
Osmond's Maxadol A	5,000	Nil	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
Osmond's Maxadol A and D3	5,000	500	" " " " " "
P.A.F. Vitaminized Emulsion	5,000	Nil	Poultrymen and Farmers Trading Co. Pty. Ltd., 276-286 Queensberry-street, North Melbourne
P.A.F. Plus Vitaminized Oil	5,000	500	" " " " " "
A.B.C. Emulsified Fish Oil A	5,000	Nil	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
A.B.C. Emulsified Fish Oil A and D	5,000	500	" " " " " "
Elliotts Vitamin Emulsion	5,000	500	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Rudduck's Vitolf	400	40	Rudduck and Co. Pty. Ltd., 556 Lonsdale-street, Melbourne

* Contains 16 per cent. salt. † Contains 3 per cent. lime.

Distinguishing Brand Name.	Guaranteed Composition.							Manufacturer or Importer.
	Salt.	Phosphoric Acid.	Lime.	Magnesia.	Iron.	Sulphur.	Iodine.	
STOCK LICKS.	% (Max.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	
Common Salt.								
Hart's Roklik	100·0	..	..	..	..	..	..	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Ram Salt Lick	100·0	..	..	..	..	..	..	Cheetham Salt Pty. Ltd., 71 Little Malop-street, Geelong
Ram-Lic	97·0	..	..	..	..	3·0	..	" " " " "
Hart's Iodised Block Lick	99·0	..	..	..	0·5	..	Trace	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Hart's Sulphurised Block Lick	98·0	..	..	..	..	2·0	..	" " " "
Bone Meal, &c.								
Apex Sterilized Bone Meal	..	24·0	28·0	..	..	..	..	North-Eastern Bone Products, Wangaratta
Tricalos Sterilized Bone Flour	..	30·0	40·0	..	..	..	..	Glues and By-Products Pty. Ltd., 86 King-street, Melbourne
Pannifex Bone Meal	..	22·0	26·0	..	..	..	..	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Dicalcic Phosphate	..	37·5	29·6	..	..	..	..	Commonwealth Fertilizers and Chemicals Ltd., 65 William-street, Melbourne
Bone Meal	..	21·8	27·6	..	..	..	..	J. Cockbill Pty. Ltd., Footscray-road, Footscray
Bone Grit	..	20·0	25·3	..	..	..	..	" " "
Hortico Sterilized Bone Meal	..	22·0	27·0	..	..	..	..	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
MIXED STOCK LICKS.								
Non-Salt.								
Cobaltised Concentrated Vic-Lic†	..	24·0	29·9	..	5·8	..	Trace	Wilcox, Mofflin, Ltd., 34 King-street, Melbourne
Vic-Lic D Concentrated Sheep Lick	..	24·0	29·9	..	2·9	..	Trace	" " " "
Vic-Lic G Concentrated Sheep Lick	..	24·0	29·9	..	5·8	..	Trace	" " " "
Vita-Lick Concentrated D	..	23·5	30·0	..	1·3	2·0	Trace	Goldsbrough, Mort, and Co. Ltd., 526 Bourke-street, Melbourne
Vita-Lick Concentrated G	..	23·5	31·0	..	3·5	4·0	Trace	" " " "
Vita-Lick Cobaltised and Copperised Concentrated G†	..	23·5	31·0	..	3·5	4·0	Trace	" " " "
Vita-Lick Concentrated Cattle Lick†	..	28·2	36·1		3·5	0·45	Trace	" " " "
Vita-Lick Cobaltised and Copperised Concentrated D†	..	23·5	30·0	.	1·3	2·0	Trace	" " " "
Eureka Poultry Minerals	..	2·1	4·4	0·1	0·1	0·25	Trace	Eureka Mineral Poultry Foods, 14 Chesterville-road, Cheltenham
Rawleigh's Poultry Powder†	..	16·7	38·7	..	0·4	4·0	Trace	The W. T. Rawleigh Co. Ltd., 60 Dawson-street, Brunswick
Osmond's Concentrated Lick for Cattle	..	15·0	12·0	1·2	0·7	12·0	Trace	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
Osmond's Osmin Concentrated Cattle Lick†	..	15·0	12·0	1·2	0·7	12·0	Trace	" " " "
Osmond's Mineral Concentrate for Sheep	..	27·0	32·0	0·4	0·5	.	Trace	" " " "
Rudduck's Mineral Supplement*	..	7·0	10·0	..	..		.	Rudduck and Co. Pty. Ltd., 556 Lonsdale-street, Melbourne
Minalick (Concentrate)	.	15·5	22·0	4·95	1·8	1·8	..	Standard Stock Service Co., 386 Flinders-lane, Melbourne
Vetsolick Mineral Concentrate		11·0	14·0	0·7	1·5	16·6	Trace	A. H. McDonald, 627–631 Bridge-road, Richmond
Calcium Manger Block			25·0		..	..	..	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Calcium Phosphate Manger Block	..	6·0	25·0	..	..		..	" " " "
Calcium and Trace Element Manger Block†	.	5·0	20·0	0·16	0·15		Trace	" " " "
Magnesium Sulphate Manger Block		..	25·0	0·82	..		..	" " "

* Contains 20 per cent. protein. † Contains cobalt and copper.

Distinguishing Brand Name.	Guaranteed Composition.							Manufacturer or Importer.
	Salt.	Phosphoric Acid.	Lime.	Magnesia.	Iron.	Sulphur.	Iodine.	
MIXED STOCK LICKS—*continued.*	% (Max.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	
Low Salt.								
Allkon Concentrate	8·0	12·0	30·0	..	1·0	..	Trace	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
Vic-Lic Concentrated Cattle Lick	5·5	23·0	29·0	..	2·9	..	Trace	Wilcox, Mofflin, Ltd., 34 King-street, Melbourne
Immunolic Concentrate ..	8·0	12·0	30·0	..	1·0	..	Trace	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Medium Salt.								
Rudduck's Improved Mineral Lick	22·2	11·3	20·3	0·6	0·6	2·4	Trace	Rudduck and Co. Pty. Ltd., 555 Lonsdale-street, Melbourne
Rawleigh's Mineralized Supplement for Stock	15·0	12·2	27·0	..	1·0	3·6	Trace	The W. T. Rawleigh Co. Ltd., 60 Dawson-street, Brunswick
Vetamac Mineral Supplement†	30·0	10·8	14·1	Trace	0·2	0·8	Trace	A. H. McDonald, Stock Service Department, 627–31 Bridge-road, Richmond
B.v.E's. Mineral Supplement†	18·0	10·0	18·0	7·5	0·5	..	Trace	B. van Eerten, Clyde-road, Berwick
Por-Co-Vite†	14·0	19·1	29·3	..	0·6	9·6	Trace	Goldsbrough, Mort, and Co. Ltd., 526 Bourke-street, Melbourne
Min-A-Feed (Green Band)† ..	21·0	18·0	22·0	2·0	0·8	..	Trace	Hamilcar Holdings Pty. Ltd., 528 Collins-street, Melbourne
Min-A-Feed (Blue Band)† ..	16·0	12·0	18·0	6·0	0·8	..	Trace	" " " "
Min-A-Vit (Orange Band)† ..	21·0	18·0	22·0	2·0	0·8	..	Trace	" " " "
Min-A-Vit (Red Band)† ..	16·0	12·0	18·0	6·0	0·8	..	Trace	" " " "
High Salt.								
Vetamac Medicated	53·0	5·7	7·5	0·1	0·7	4·0	Trace	A. H. McDonald, 627–631 Bridge-road, Richmond
Hart's Medicated Block Lick ..	91·0	1·0	3·0	..	..	..	..	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Salvitis No. 1	90·0	1·8	2·5	0·2	0·8	0·4	Trace	Cheetham Salt Pty. Ltd., 71 Little Malop-street, Geelong
Salvitis No. 2	70·0	7·1	8·8	0·2	0·8	4·0	Trace	" " " "
Hart's Cobalt Block Lick† ..	91·0	1·0	3·0	..	..	..	..	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Fargher's Calcium-salt Lick† ..	50·0	1·0	16·0	..	..	..	..	W. J. Fargher, 610 Ligar-street, Ballarat
Osmond's Toneca	70·0	7·0	10·5	0·15	0·19	2·0	..	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
Lime Licks.								
Allkon Organic Lime Compound	..	..	7·0	..	..	..	..	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
Hart's Immunol Organic Lime Compound	..	..	7·0	..	..	..	..	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Hart's Immunol Organic Lime Powder	..	..	13·0	..	..	..	..	" " " "
Hart's Immunol Organic Lime Compound Special	..	..	7·0	..	..	..	..	" " " "
Allkon Organic Lime Compound Special	..	..	7·0	..	..	..	..	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne

† Contains cobalt and copper.

Melbourne, 8th May, 1953.

W. R. JEWELL, M.Sc.,
Chief Chemist.

Journal of the Department of Agriculture

VICTORIA

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Irrigated Lucerne in Victoria

By A. MORGAN, B.Agr.Sc., Senior Irrigation Officer

Previous instalments in this series of articles on irrigated lucerne in Victoria appeared in the February, August, and October, 1952, and February, 1953, issues of this Journal.

Original flora of the western section of the Murray Valley. Left.—Tea tree. Right.—Box tree.

UTILIZATION OF LUCERNE

UTILIZATION of lucerne can be considered under the following headings :—

Grazing.
Cutting for green feed.
Haymaking.
Processed lucerne hay.

Grazing

A system of quick grazing, involving permanent or temporary subdivision suited to the number of stock grazed, avoids as far as possible any damage which could contribute to shortening the life of the stand.

The risk of "bloat" is always present. The experiences of irrigators engaged in dairying do not provide any information which fixes any particular stage of growth or condition of lucerne growth as more conducive to bloat. Losses of three or four cows a year on a property due to this complaint are not common, but they are not rare. There is an indication that regulation of the daily period of grazing on lucerne has some effect in minimizing the trouble. (See Departmental pamphlet, "Hoven or Bloat in Cattle," by A. R. Grayson.) Allowing the lucerne to go past the best stage in regard to fodder quality does not automatically eliminate all risk of bloat.

To ensure reasonable longevity of the stand, it is desirable to arrange grazing so that each lucerne patch grows to full maturity at least once during each season. A good deal of research has been done in U.S.A. in regard to the effect of various systems of management on the root reserves and in turn on subsequent productivity and length of life, but none of this type of work has been done in Victoria.

No experimental results in regard to the merits or otherwise of the strip-grazing technique as applied to lucerne utilization are available in this State.

A "bloat" case on lucerne. A shorter period of grazing on the lucerne stand may have saved this cow.

Cutting for Green Feed

Some years ago, the supply of bundled green lucerne of high fodder quality, and other fodders in season, to the metropolitan area, from the Werribee irrigation district, was considerable. It is now a minor industry as far as lucerne is concerned. Present price is 7s. per dozen bundles. The cutting of green lucerne for on-the-farm consumption by poultry and stock is still practised, although for poultry feed the use of the motor-lawnmower to harvest pasture has been adopted by some. The pasture clippings have the advantage of being less fibrous and not requiring further chopping. To obtain the best quality and high yield combined, the same procedure should be followed, as far as possible, as for lucerne hay.

Hay-making

The main practical considerations in making lucerne hay are to get the highest yield compatible with good fodder value, and to ensure that the excellence of the crop as cut with the mower is not impaired any more than can be avoided during curing, storage, and feeding out. All of which is easier said than done, in view of the fact that the weather is apt to be unfavorable in one way or another during the period between cutting and storage. Table 18, derived from records of experimental plots, shows that this period may be anything from one day to a fortnight, when either exceptionally dry or showery conditions are encountered, but with good weather it is more likely to be from five to eight days. These figures apply to lucerne which is cocked and stacked as loose hay.

As might be expected, the period at Werribee, a southern district, is in general a day or two longer than in the drier northern districts of Cohuna and Swan Hill. The figures in Table 18 represent three or more years at each centre and include all the cuts for each year. The cuts which required a fortnight or so to cure before carting were those made in April.

The table illustrates the point that a fair proportion of cuts are followed by weather conditions unfavorable to curing, and it is clear that production of high quality lucerne hay on any one farm throughout an entire irrigation season is difficult to achieve. The weather is probably a more potent factor influencing general hay quality than any other.

TABLE 18.—PERIOD BETWEEN CUTTING AND CARTING AT SOME IRRIGATION CENTRES.

Days Between Cutting and Carting.	Number of Cuts on Plots at—			
	Cohuna.	Swan Hill.	Tongala.	Werribee.
1– 2	1	1	1	..
3– 4	6	4	..	5
5– 6	7	5	4	1
7– 8	3	2	4	10
9–10	1	1	1	7
11–12	..	..	1	3
13–14	1	1	..	3
15–16	..	..	..	1

However, this risk is unavoidable. "Nothing will be attempted if all possible objections must be first overcome," said Samuel Johnson. So the selection of the right time to cut should be based on the stage of growth of the majority of plants in the paddock, rather than on a personal forecast of the probable weather conditions during the next week.

Tests have shown that there are two features which are indicators of the right stage to cut if quality is to be secured without undue depreciation of quantity. These are

(*a*) the appearance of blooms, and (*b*) the growth of new shoots from the base ("crown") of the plant. It has also been found that the two features must be considered conjointly, as both are affected to some extent by (*a*) season of the year, and (*b*) irrigation timing. To illustrate this point—appearance of blooms and of new shoots at the crown are normally coincidental if soil moisture conditions have been maintained at the right level for active growth.

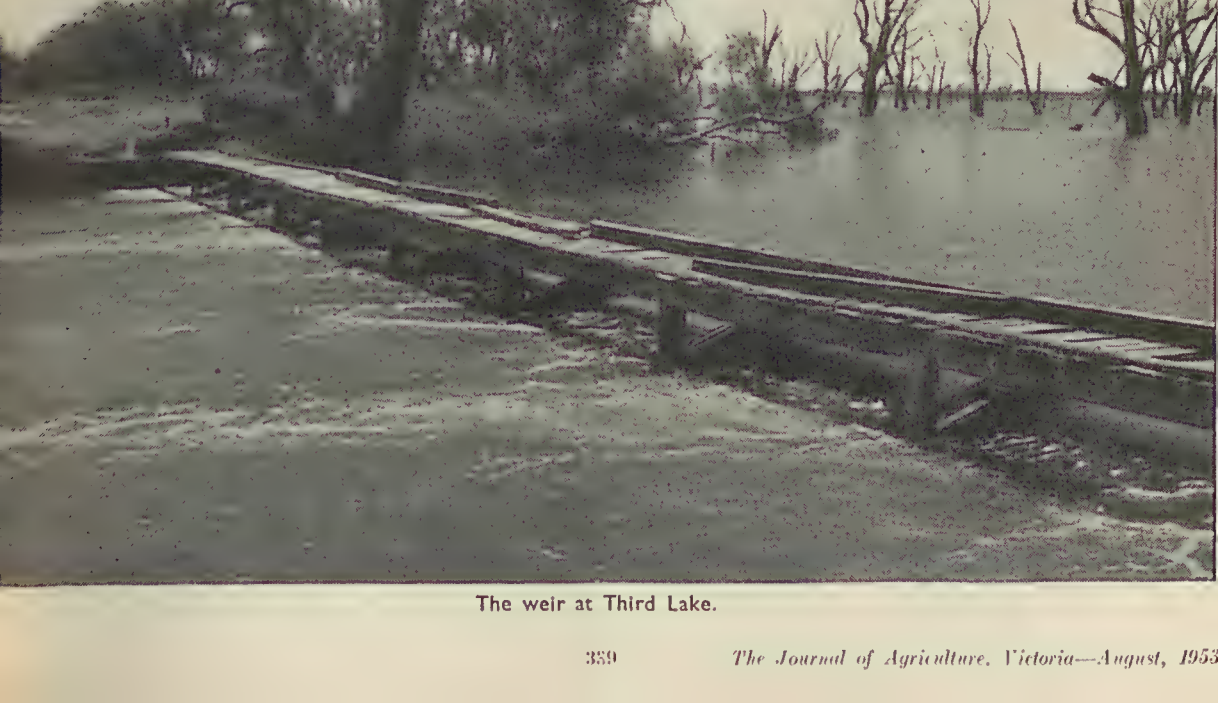
If the lucerne is allowed to suffer in regard to moisture, however, blooming will commence without the appearance of new shoots. (This premature blooming, in an exaggerated form, has been referred to earlier in connection with lucerne grown on soils showing poor penetration of irrigation water).

On the other hand, if the lucerne has been well watered, the new-shoots-formation may precede the commencement of blooming, particularly in the cooler parts of the season (that is, at the beginning and end of the irrigation season). The early blooming stage, as shown by fodder analyses, gives a good quality hay, while at the same time the yield is good. Delay in cutting, so that the new shoots are cut off, delays the following cut.

The timing of irrigations, in relation to the cutting, is also important for other reasons, viz.: (*a*) effect on the following cut, (*b*) effect on rate of curing of the hay, (*c*) effect on conservation of leaf. These things are inter-related and can be briefly discussed as follows:—

In northern irrigation districts, where very rapid drying of plant tissue is normal in summer, cutting, raking, and storage (by baling or stacking) should be carried out in such a way as to minimize the development of a brittle condition of the leaves due to excessive dessication. Hot, dry winds dry out the leaves rapidly, but the thicker stems remain moist, so that although the leaves are easily shattered the hay as a whole is not cured sufficiently for stacking or baling. Early raking after mowing slows down the rate of drying and helps to conserve the leaf, particularly if the lucerne is then cocked.

Cocking is not done where baling by "pick-up" baler is contemplated. These machines have become so popular through the work of contractors that cocked lucerne hay is now a comparative rarity. Similarly, hay loaders are well adapted for picking up hay from windrows.



The weir at Third Lake.

A log-buggy used to clear land for irrigation in the early days.

making cutting difficult, while the dense growth causes yellowing of the shaded leaves. Taking everything into consideration, two waterings between summer cuts is the best way to get good yields combined with good quality. On some soils, the pre-cutting irrigation is required to be given about ten days before cutting is contemplated, as it takes that time for the ground to firm sufficiently for the passage of implements. The probable period between cuts is, therefore, of some interest (see Table 19).

If the paddock has been watered before cutting, the moist ground assists in delaying drying of the hay. There are objections to watering before cutting, such as the greater difficulty in observing the rate of advance of irrigation water down the bays without a good deal of walking, and the discomfort of walking through wet lucerne in showery weather, to make observations. On the other hand, if by delaying an irrigation the growth of the lucerne is checked by soil-moisture shortage, the crop takes a longer period to get away after the cutting, especially as (see Table 18), it is usually a week after cutting before any irrigation can be done.

Heavy irrigations cause deterioration in quality. Coarse, rank growth results and may "go down" in rough weather,

Slightly more than half the cuts were 41 to 46 days apart, so that six weeks may be taken as an average period between cuts.

Moisture percentage at the time of storage is a main factor influencing hay quality. The variations encountered are shown in Table 20.

Hay can be stored in bales at a higher moisture content than if stacked as loose hay. For that reason, and also because contract balers are frequently unable to commence work exactly when required, it is generally agreed that average baled hay

Original flora on western section of the Murray Valley irrigation district—wild tobacco.

Murray River in flood; levee bank in foreground.

suffers in a quality comparison with loose hay, either because of mould development, browning, or leaf shattering.

TABLE 19.—NUMBER OF DAYS BETWEEN CUTS OF LUCERNE PLOTS.

(*Note.*—First cut usually in late October.)

Centre.	Season.	Days Between—			
		Cuts 1 and 2.	Cuts 2 and 3.	Cuts 3 and 4.	Cuts 4 and 5.
Swan Hill ..	1924–25	44	41	51	77
	1925–26	47	43	46	51
	1926–27	48	42	45	50
	1928–29	44	42	41	43
Tongala ..	1925–26	42	42	32	69
	1927–28	38	46	44	53
	1928–29	38	39	41	53
	1930–31	46	49	45	..
Cohuna ..	1926–27	..	35	43	40
	1927–28	35	42	38	45
	1928–29	42	37	42	53

YIELD PER CUT.

Lucerne being a summer grower, it could be expected that if optimum soil-moisture conditions could be maintained throughout the irrigation season, the heaviest cuts would be in the late spring or midsummer period. However, the records of plots (as for instance those for the Swan Hill plots, shown in Table 21) show considerable variation in the placement of the heaviest cut for each season. The rainfall in northern districts is very variable in incidence in the summer months, and in addition to the effect from this the cutting of lucerne is necessarily delayed by wet weather, during which time further growth can occur.

TABLE 20.—VARIATION IN MOISTURE CONTENT OF LUCERNE HAY AT TIME OF STORAGE, 1926–31, ALL CUTS FROM FIELD 8.S.E., STATE RESEARCH FARM, WERRIBEE.

Moisture Percentage.	Number of Cuts.
10–13·9	11
14–17·9	22
18–21·9	18
22–25·9	21
26–29·9	8
30–33·9	7
34–37·9	1

NOTE.—Very high moisture contents indicate a proportion of free water from showers.

The period for which any investigation of lucerne can be continued in a set of plots is limited because the full production may

not be reached until the third season, and by the eighth season the stand is usually thinning out.

TABLE 21.—YIELDS OF LUCERNE HAY AT DIFFERENT CUTS, SWAN HILL, 1924–29.

Season.	Cut No. 1.	Cut No. 2.	Cut No. 3.	Cut No. 4.	Cut No. 5.
	cwt./ac.	cwt./ac.	cwt./ac.	cwt./ac.	cwt./ac.
1924–25	22·7	24·9	31·0	20·0	8·1
1925–26	35·8	35·4	29·7	25·5	19·7
1926–27	36·3	45·5	30·7	26·3	13·8
1927–28	24·2	35·2	26·0	30·3	15·9
1928–29	33·6	42·8	19·2	32·8	20·4

Plant population counts at Werribee have shown that in stands which are still in full vigour the greatest number of plants per unit area is maintained for the longest period on the lowest levels of moisture supply and topdressing but that yields under these conditions are very low. As the amount of irrigation water supplied per season is raised, up to 24 inches, the number of plants declines, but the remaining plants produce more growth. These vigorous plants probably indicate proper adjustment of their root-systems to the available root room and may in part account for the poor results usually obtained when attempt is made to thicken the stand by sowing more seed. On one property at Swan Hill, a stand was thickened up satisfactorily by withholding irrigation for a lengthy period, allowing the lucerne to seed, and then irrigating after scattering the seed. The soil type at this site was not subject to water-logging to the extent of development of high water table, which is the case with a portion of the flats.

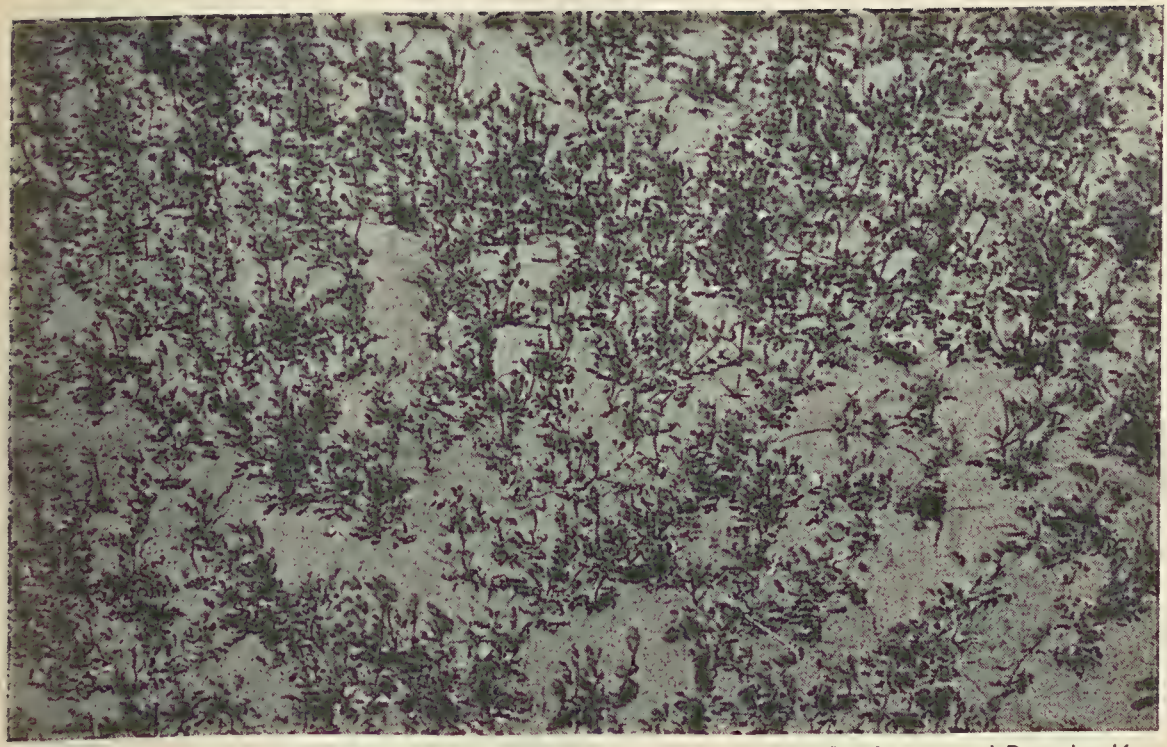
Processed Lucerne Hay

A large tonnage of lucerne hay has been processed in the Murray Valley Irrigation District for use in stock pellets and mixed feeds for cattle, pigs, and poultry. Between November, 1951, and June, 1952, 1,300 tons of hay was hammer-milled at one mill. A further quantity held in reserve for winter milling amounted to 800 tons. The approximate composition of the milled product was protein, 15 per cent.; fat, 1 per cent.; carbohydrate, 30 per cent.; fibre, 33 per cent.; water, 14 per cent.; ash, 7 per cent. The Vitamin A content averaged 70 units per gram.

In connection with this industry, it is interesting to note the developments* which have taken place in U.S.A. since 1900. Carotene, source of vitamin A, is partially destroyed if lucerne hay is field-cured. To overcome this, and produce a lucerne meal suitable for incorporation in mixed feeds and stock pellets, dehydration has been resorted to. To ensure a good product, the

* "Concentrates and Meals of Alfalfa," G. H. Brother, U.S.D.A. Year-book of Agriculture, 1950-51.

White clover occupying "drowned out" areas in a lucerne field.



Young lucerne on property of Mr. T. Bott, Dingwall, sown on September 26, 1952; first watered December 16. The photograph was taken on December 18, 1952.

lucerne is cut at pre-bloom to one-tenth bloom stage, chopped in the field, and hauled in trucks not more than 10 miles, where it is fed to a large rotating drum drier in which the air is heated to about 1,700 deg. Fahr., and the emerging material, after up to three runs through the drier, has a moisture content of about 8 per cent. This meal is sold in three grades of protein content—13, 15, and 17 per cent. The problem of maintaining the carotene content of the meal by the use of anti-oxidants has also received attention. It has been learned that if more than 10 per cent. of dehydrated lucerne meal is fed to chicks they show retardation of growth, whereas the usual ration of 5 per cent. in the ration is beneficial.

Experiments have also been made with juice, extracted from fresh lucerne, and concentrated by drying. These activities are of course related to the fact that lucerne is the leading forage crop in U.S.A., accounting for one-third of the annual hay crop of 100 million tons.

LUCERNE GROWN UNDER SPRAY IRRIGATION

There has been considerable recent interest in the possibilities of spray irrigation for the production of green feed in the mid-summer period, especially for dairy cattle. Crops which can be grown for this purpose and are known to do well under irrigation include Japanese millet, the sorghums, maize, pasture, and lucerne. The value of the feed obtained from a small area under sprays must be considered to be high because without the irrigation facilities it would be unobtainable. The system can be applied in high rainfall areas with success, enabling growth to be continued during the normally dry period of summer.

As pointed out in the first article of this series (February, 1952, Journal) however, the installation of spray irrigation in an area where gravitation supplies are available is justified only for special situations, e.g., where the topography is unsuitable for grading and normal border-check irrigation layout, or for crops (such as fruit and vegetables) of a high production value per acre.

As the situations where spray irrigation can be profitably employed for lucerne growing are located away from irrigation districts, and in areas where no detailed soil surveys have been made, the first considerations are (*a*) is sufficient water available? and (*b*) is the soil suitable?

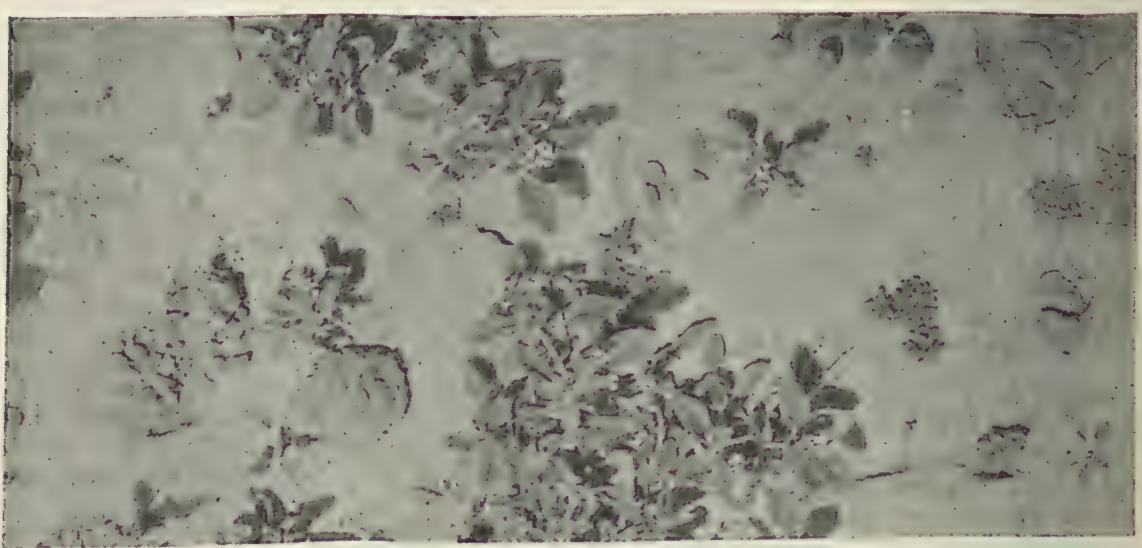
The best available guide to water requirements is obtained from the Werribee irrigation trials. As irrigation is a method of supplementing the rainfall to provide a continuous sufficiency of soil moisture to the crop, the amount of water required will be related to the average rainfall, in any district, during the summer period or during the irrigation-season period.

At Werribee the rainfall during the period September–March averages 12 inches. For full production from lucerne, an additional 24 inches of irrigation water, on the average, has to be supplied. Under flood irrigation systems, a proportion of this water is wasted by penetration to depths at which it is of little or no use to the plant. The average amount absorbed by the soil, if irrigation is done each time the plant foliage indicates the necessity for it, is 1¾ inches.

With the spray irrigation system, any quantity up to 1¾ inches could be applied at a watering, whereas with the flooding system it is a practical impossibility (see graph showing "absorption of water in inches" against "time," Fig. 1, page 438, October, 1952, issue), to reduce the quantity applied below 1¾ inches.

A certain amount of water may thus be saved by spray irrigation, but considering the diversity of soils to which spray irrigation may be applied there is little value in any estimate of the probable amount which can be saved. Each operator will with experience be able to state the average amount required for his particular soils. For this discussion we can assume that the total water required for best results will be 36 acre-inches, and the amount to be supplied by spray irrigation will be 36 inches *minus* the average rainfall in inches during the September–March period per acre. The water used will be obtained from (*a*) a pipeline, (*b*) dams, (*c*) a watercourse or (*d*) a bore. The intending irrigator therefore requires to estimate how much water he has to work with. On a pipeline (as for instance the Bellarine Peninsula or Yan Yean supplies) the amount available can be ascertained and it is measured by the thousand gallons at a fixed charge; there is no difficulty in estimating the area which can be irrigated. If the water is obtained from a dam, the capacity of the dam should be worked out using the following formulae and tables. Dams may be of the hillside or gully type, or earth "tanks".

Details of the recommended methods for construction of these, and for provision for cleaning out periodically and for safe disposal of overflow waters, are given in two publications issued by the State Rivers and Water Supply Commission, "Farm Irrigation and Drainage" and "Farm Water Supplies,"



Cultivation is required for control of summer weeds. The growth shown is of the Common Heliotrope (*Heliotropum europæum*).

compiled by H. B. Lincoln. Acknowledgment is made here in regard to tables and other information taken from them.

The estimation of the capacity of irregularly-shaped water storages of varying depths will involve making sufficient measurements to calculate total volume; the number of gallons can be calculated from the formulae—1 cubic foot = 6¼ gallons; 1 cubic yard = 169 gallons. The amount of water required to give an irrigation of 1 inch over an acre is 22,700 gallons. An acre-foot of water is 43,560 cubic feet, equals 272,250 gallons. Mr. Lincoln's recommendation for estimating approximate yield of a spring or stream is:—Select a straight length of 15 or 20 yards where the stream is fairly uniform and there are no eddies. Measure the breadth and depth at three or four places, and from these obtain the sectional area of the channel. Drop in a chip of wood and find the time it takes to travel a known distance, say, 30 feet. This gives the surface velocity of the stream in feet each second; then if V = surface velocity of stream in feet per second, A = average section area of stream in square feet.

$V \times A \times \frac{4}{5}\text{ths}$ = yield in cubic feet per second or $V \times A \times \frac{4}{5}\text{ths} \times 6\frac{1}{4} \times 60$ = gallons per minute.

If the stream is only a very small flow, it is better to measure it into a vessel of known capacity and check the time taken.

Those who have had previous experience of irrigation can with reasonable accuracy estimate a flow in a small stream by comparison with flows which they have used from a Dethridge wheel-meter or from outlets and can estimate the area likely to be irrigated by such flow in a given time by flood irrigation. Allowance would have to be made for any difference in soils.

Common weeds in northern irrigation areas. Left.—Spear Thistle. Right.—Saffron Thistle.

TABLE 22.—CAPACITY (FULL) OF EARTHEN STORAGE TANKS ON LEVEL GROUND AND NO STORAGE ABOVE GROUND LEVEL.

Slopes.—1 in 1½ on three sides and 1 in 3 on approach side at one end of longest axis of top area.

Top Area of Dam (Ground Level).	Bottom Area.	Depth.	Capacity—	
			(*a*) Cubic Yards.	(*b*) Gallons.
ft. ft.	ft. ft.	ft.		
72 x 54	18 x 18	11½	750	126,750
82 x 56	28 x 20	12	1,000	169,000
92 x 62	38 x 26	12	1,350	228,150
94 x 66	40 x 30	12	1,500	253,500
108 x 72	54 x 36	12	2,000	338,000
116 x 80	62 x 44	12	2,500	422,500
120 x 90	66 x 54	12	3,000	507,000
111 x 90	43 x 45	15	3,000	507,000
120 x 102	66 x 66	12	3,500	591,500
116 x 97	48 x 52	15	3,500	591,500
124 x 109	70 x 73	12	4,000	676,000
124 x 100	56 x 55	15	4,000	676,000
132 x 113	78 x 77	12	4,500	760,500
130 x 105	62 x 60	15	4,500	760,500
136 x 120	82 x 84	12	5,000	845,000
134 x 111	66 x 66	15	5,000	845,000
148 x 132	94 x 96	12	6,000	1,014,000
143 x 120	75 x 75	15	6,000	1,014,000

Umbrella Sedge.

It has been mentioned earlier that the total water required for best results with spray irrigation of lucerne (and incidentally, of perennial permanent pasture in which white or strawberry clover is the main legume) is considered, in the absence of any information to the contrary, to be 36 inches less the average rainfall in inches for the September–March period. The newcomer has to convert this into gallons per acre total requirements, using the formula—

$(36 - X) \times 22{,}700$, where X = Sept.–March, rainfall average.

If the capacity of the storage is known, or the flow available from a running stream, the acreage for which sufficient water is available can be worked out, and the next step is to select the make and type of spray irrigation installation which will be best suited to the conditions.

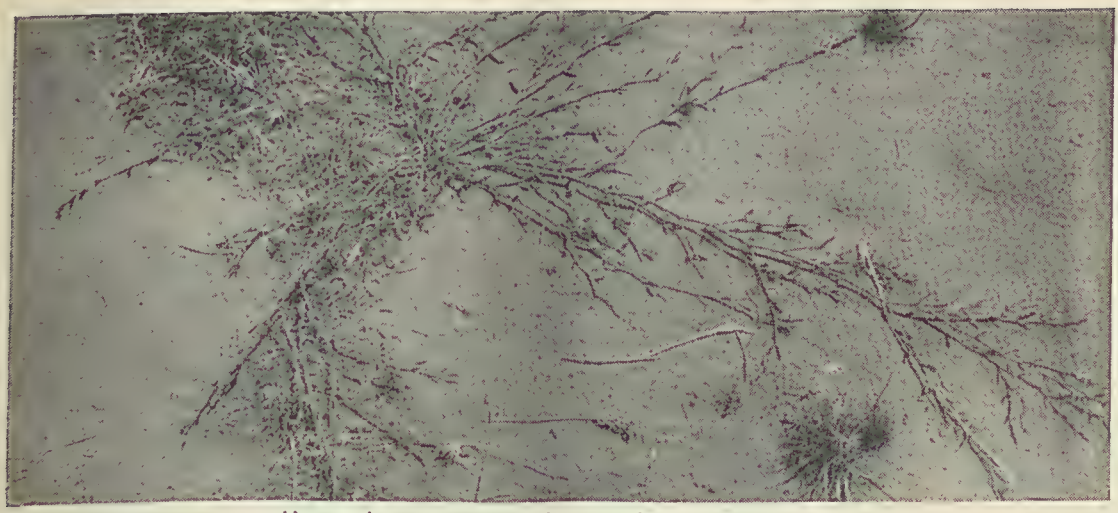
It is not proposed here to make any recommendation for a particular type or make of installation, but to give a general description of the different types available. They may be divided into:—1. Movable types, and 2. Fixed types, and in each case may employ either (*a*) Sprinkler, or (*b*) Rotary jet spray-heads.

In the fixed types the sprinkler or the rotary jet is permanently installed with the pipeline, while in the portable types the distributing pipelines and/or the sprinklers or rotary jets are connected to the source of supply by portable pipes or hoses, and a variety of ingenious methods of quick coupling have been developed by makers.

As piping is an expensive item, the cost for any particular installation may be greatly reduced by operation on a portable basis, but the labour entailed in irrigation is then increased; this has been reduced by the introduction of light aluminium piping, in some cases, in place of galvanized iron. The disadvantage of a fixed installation in regard to passage of implements is overcome by covered piping and standpipes which can be quickly removed.

Sprinklers have been devised, with special arrangements of the outlet holes, to spray a square area; rotary jets apply water to a circular area and overlapping of the areas sprayed by adjoining jets is necessary to ensure that all parts of a crop or pasture receive water.

The traction engine was a common source of power for pumping in pioneer irrigation ventures.



Hogweed, a common weed on northern irrigation areas.

The conditions under which a spray installation is required to work vary from farm to farm, and makers issue questionnaires to prospective purchasers to ascertain essential information such as area to be irrigated, dimensions of area, lift, distance from water supply, type of power available for pumping, and type of crop to be irrigated.

A further instalment of this series of articles on irrigated lucerne in Victoria will appear in a subsequent issue of the Journal.

Mange in Pigs

Most pig breeders have seen pig mange, and readily recognize the disease when it is in a severe form, but milder cases are sometimes overlooked and become a source of infection to clean animals.

Two types of mange occur in Australia, and although they cause different symptoms, treatment is the same. *Sarcoptic mange* or scabies, is caused by a mite. The female burrows into the skin and lays her eggs. Infection is spread by the larvae, which wander on the skin. The mites are very susceptible to dryness and live less than three weeks away from the pig. Irritation caused by the burrowing female causes great loss of sleep and condition. The eyes, ears and nose and butt of the tail are most commonly effected, and the disease may spread to the neck and back. In severe cases progressive emaciation and even death may occur. Mange is seen mainly in poor-conditioned animals in the harder seasons, i.e., end of winter and early spring.

Demodectic mange is not so common in Australia as sarcoptic mange. The mite burrows into the base of the hair, causing the hair to fall out, and the production of small pockets of pus. The snout and eyelids are usually affected, and the conditions may progress to the throat and breast. Demodectic mange may not be noticed until the pig is skinned, when large pus-filled cavities will be found.

Treatment of both types has been made much more effective by the introduction of benzene hexachloride in recent years. Chlordane, a later American insecticide, is also very effective. The old and tried remedies are quite efficient if it is remembered that the eggs in the burrows cannot be reached, and that remedies must be applied three or four times, at intervals of four days, to kill the larvae as they emerge from the burrows. Lime sulphur (1 gallon concentrate to 10 gallons water) or kerosene, $\frac{1}{2}$ pint, in 1 lb. of lard, can both be used. Crude oil in repeated applications is also effective. Mange is an infectious condition and all pigs should be treated when the disease is diagnosed and all pens left unoccupied for three weeks. [Contributed by the Live Stock Division.]

THE DAIRY FARM

Care of Cream after Separating

ALTHOUGH it may be produced from high-quality milk, cream can afterwards be spoilt very easily by lack of care between the time it leaves the separator and the time of despatch to the factory. Observance of the following points in the treatment and storage of cream ensures a high-quality product.

Cans

Cans should be thoroughly cleansed and sterilized prior to use. Although they have been cleaned and sterilized at the factory, they can easily become contaminated again afterwards. Cans should be closely examined periodically to ensure that they are well tinned and free from cracks, large dents, and rust pitting. Where the inside of a can or a can lid is pitted with rust spots or the base metal is exposed, a metallic flavour in the cream readily develops. Cans need to be in first-class condition as cream is usually left in them for a considerable time and this gives the acid of the ripening cream an opportunity to attack any poorly-tinned surfaces.

Mixing of Cream

Warm cream should not be mixed with cold cream, otherwise the quality will be adversely affected. Much cream is downgraded at the factory as a result of this practice. Consequently it is not wise to separate directly into a can which was partly filled with cream at a previous milking. It is not detrimental, however, to mix two lots of cream when they are at the same temperature. In fact, cans should be "topped up" to prevent splashing of the cream inside the cans during transport to the factory. When considerable splashing of the cream occurs and the sun's rays are allowed to heat the sides of the can, a tallowy flavour may develop in the cream.

Cooling

The temperature of cream as it comes from the separator is little below the blood heat of the cow. If no effort is made to cool the cream, conditions are ideal for the rapid growth of bacteria. Cream should be run over an approved type of cooler using the coldest water available on the farm. When cream is cooled as it runs from the separator to the can, the growth of bacteria is retarded.

Storage

Cream is best stored in a cool place. The atmosphere should be free from musty, sour, and chemical odours and engine fumes. Where possible the cans should be stored above floor level so that air can circulate underneath them. A good position in the room is between two

Top,—Meeting the carrier at the roadside ensures that the cans of cream will not be exposed to warm conditions for any great length of time.

Right.—Leaving cans exposed to the sun accelerates the growth of bacteria in the cream. Denting weakens the tinning on the inside of the can.

wall vents. Cans should not be stored in a position where the rays of the sun can strike them through a window or door.

The lids of cans should not be placed in position during storage. However, although the room may be fly and vermin proof, it is advisable as a general practice to protect the cream by placing a wire gauze cover over the top of the can. Suitable wire gauze covers may be purchased at a small cost.

Stirring

Cream should be frequently stirred during storage. A well-tinned plunger-type metal stirrer is very suitable as it will thoroughly mix the cream in the can. Stirring releases a lot of the objectionable gases which form in cream and ensures that the cream ripens evenly throughout the can. A wooden spoon or paddle is unsuitable as a stirrer, as the wood becomes absorbent and therefore difficult to sterilize. The stirrer should never be left in a can of cream.

Delivery

Cream should be delivered to the butter factory as frequently as possible to prevent undue deterioration of its quality. If the cream is to be collected by a carrier at the roadside, the cans should be taken to the road only a short time before the carrier is scheduled to arrive. The cans are best left in a well-shaded position out of the reach of animals, particularly dogs.

Cream carters are required by regulation to equip their vehicles with an approved type of cover from the first day of September each year to May 31st in the following year. It is in the interests of the farmer to ensure that the vehicles have a satisfactory cover.

Summary

1. Use sterile, well-tinned cans.
2. Never mix hot and cold cream.
3. Cool cream over an approved cooler using the coldest water available on the farm.
4. Store cream in a cool, well-ventilated room and protect from dust, flies, and vermin.
5. Stir cream frequently with a well-tinned, plunger-type metal stirrer.
6. Deliver cream to the factory as often as possible and protect the cans from the sun and other injurious agents while they stand at the roadside awaiting the carrier's arrival.

Attention to all these points is important now. It will be even more important in the warmer weather.

[J. C. Newman, Dairy Supervisor.]

Keeping Dairy Farm Financial Records

Those dairy farmers who have lately completed their income tax returns, and those others who are still struggling with theirs, will have felt some concern over methods of keeping accounts.

It is given to few dairy farmers to understand, much less to operate, a full-scale double-entry system. Bookkeeping of that kind may be necessary in a large enterprise, but on a small farm, the debiting of an amount to the cartage account and the crediting of the same amount to some other account, and operations of like nature, savour of useless unreality.

On the other hand, those who keep all their information on their cheque butts are apt to find later that they have incurred some searching of old dockets, hoarded in disorder if not lost, if they are to make even the simple classifications of their costs needed for tax returns.

Something between these two systems is needed; a system which allows ready analysis of operations but does not mean a lot of writing and figuring for the farmer who has little time and less inclination for this type of work.

The Multiple-Column Analysis.

A single entry system of this type seems best to suit the ordinary dairy farm, and the book used can be bought almost anywhere. It is one of those with the pages ruled into a number of columns, each designed to record sums of money. On one of these pages it is a simple matter to record the date on which a cheque was paid out, to whom it was paid and, in the first money column, the amount of the cheque. In the other columns the total amount can be then subdivided. For instance, there would be so much for feed, so much for machine parts, and another amount for fertilizer, all obtained from the same general store and paid for in the one cheque. If these columns are all added later, the total of the first column should equal the combined totals of the others, thus giving a check on the additions as well as a total for each kind of cost.

The same kind of system can be used for the income received, using another book or a different section of the same book, so that separate totals for income received from milk or cream, from pigs, from calves, and surplus stock, and so on, can be kept.

There are Still Difficulties

The multi-column analysis system sounds deceptively simple, and simple it would be if each transaction were straightforward and made by cheque. But in real life there are complications. The cheque from the factory may be for a net amount after cartage has been deducted. Sometimes membership fees for organizations are also deducted by arrangement, while other factories offer trading facilities or veterinary services, and may deduct from the pay cheque any amounts owing for goods supplied or services given.

The outgoing side can become equally involved. A £20 account from the local store may include charges for food (private or household), stock food (current farm cost) and roofing iron for a new building (capital expenditure) and motor oil (part farm cost and part private spending). The farmer pays for this account with a £30 cheque and receives £10 change which in turn may be used in private spending, farm running costs, or on capital items, or perhaps on all three.

Then there are items to be entered for which there has been no actual outgoing of money, such for instance as the depreciation charge and the farmer's wage for his own labour. Similarly, natural increase in stock numbers is a form of income not represented by a financial transaction.

The important thing is that the farmer should know that these complications do exist, and that, as far as possible, he should keep his transactions simple to avoid these difficulties. No system of record-keeping can be designed which will, in itself, disentangle all these things. Only commonsense can do that, assisted by prompt entry of each transaction either directly into the analysis columns or into a diary or cash book from which it is transferred later.

The foregoing has dealt only with the keeping of current farm accounts. The farmer who really wishes to know his financial position will, of course, keep some record of his assets and liabilities, and he will write off a portion of the value of buildings, plant, and other items in depreciation each year.

[K. M. Sillcock.]

The Young Farmer

If the opportunity offers, it is worthwhile experience to take some active part in keeping the farm financial records. Not only will you become conversant with the main farm running costs and the relative importance of each; you will also begin to understand something of the methods and the difficulties of keeping these records.

If this activity is not open to you, some experience could be gained by keeping a record of your own personal finances.

You probably have two conflicting objectives, one the desire to fulfil some pleasure or interest of the moment, and the other to invest in something of a lasting nature, such as a study course, a vehicle, a farm of your own. In what proportion do you devote your resources to these two purposes?

Or, putting it in another way, might it not be instructive for you to analyse your spending into current spending (as on entertainment) and capital expenditure, that is, the purchase of some lasting asset. You might find some fine distinctions, for instance, between the book you buy to read once for pleasure and the one you get to keep by you as a useful reference work.

Even the simplest attempt at bookkeeping will have some lessons for you. The first will probably be that the system is hopeless unless transactions are recorded promptly, and the second will be that no system can be as cut and dried as you would wish.

[K. M. Sillcock.]

Establishment and Improvement of a Dairy Herd

IV. CURRENT BREEDING PRACTICES

By T. N. EDEY, M.Agr.Sc., Assistant Supervisor of Herd Testing

Most commercial dairy farmers normally maintain their herds by outcrossing, that is by mating unrelated animals of the same breed. On the other hand, many breeders and some commercial farmers practise various degrees of inbreeding and line-breeding in their herds. In addition to these breeding policies involving animals of one breed, a considerable number of dairymen place their faith in crossbreeding as a means of raising production. Since opinions vary concerning the definition and effects of these practices, this article will be devoted to a discussion of their place in herd improvement.

Outcrossing

OUTCROSSING is the existing practice in most herds. It leaves the farmer with the widest choice of stock since he is not concerned with any particular blood-line. The practice has been proved sound by farmers and research workers who have found that a succession of unrelated proven sires will progressively raise the production of the average herd. The success of an outbreeding programme hinges mainly on the farmer's success in selecting his herd sire.

Inbreeding

Inbreeding involves the mating of animals which are more closely related than the average of their breed. The basic principle behind the practice in animal breeding is that inbreeding retains the characteristics of the animals of an inbred line and prevents their dilution by characteristics which would normally be introduced by unrelated animals. Where the chosen related animals are highly endowed with desirable productive characters the results may be beneficial, since inbreeding would reduce the risk of a retrograde outcross.

A mixed herd typical of many in the milk-producing areas adjacent to Melbourne. This herd, in the Narre Warren district, resulted from crossing Jersey, Friesian and Ayrshire cattle.

This high-producing herd at Dumbalk North was obtained by outbreeding, using a series of unrelated herd sires.

Inbreeding can act as a ratchet device to hold gains which have been made. The process of inbreeding creates nothing—it merely "fixes" whatever characteristics are already present. Therefore, nothing is to be gained by inbreeding inferior or mediocre animals since this would merely "fix" their inferiority or mediocrity.

Close inbreeding was practised extensively by early British cattle breeders, mainly because their stock were clearly superior to those of neighbouring herds, and to have outcrossed would have involved the intoduction of an inferior strain. Nowadays, however, with the wider choice of improved stock, intense inbreeding can rarely be justified.

The degree of inbreeding can readily be calculated where the pedigree is available. For example, the progeny of a sire-daughter mating is said to be 25 per cent. inbred, whilst, if first cousins are mated, the progeny is 6·25 per cent. inbred.

Close inbreeding is almost invariably accompanied by a decline in vigour, fertility, and production. These detrimental effects vary from animal to animal and with the degree of inbreeding. Most authorities advocate as a general principle not exceeding 10 per cent. inbreeding. Occasionally, however, the commercial farmer may have a particularly good proven bull and is faced with the problem of whether or not to mate the bull to his own daughters. This would involve inbreeding to the 25 per cent. level but, provided the bull is really superior, it would probably be worth mating him to some of his daughters, for against the risk of abnormalities, and of slightly decreased production and vigour in the inbred stock must be set the risk of a gross drop in production if an untried bull is used.

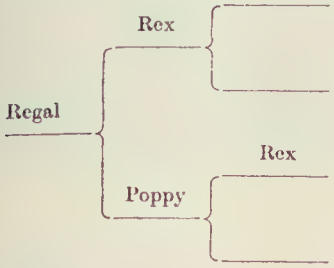
For those who would not risk saving inbred daughters of the proven bull, a good policy would be to save an inbred son for a future herd sire. Although such a bull might be slightly below normal in size and vigour, when mated to unrelated cows the detrimental effects of inbreeding would immediately be dissipated, and his high-producing qualities passed on. When mated to his own half-sisters the progeny would be approximately 15 per cent. inbred, as compared with a sire-daughter mating giving 25 per cent. inbred progeny.

Linebreeding

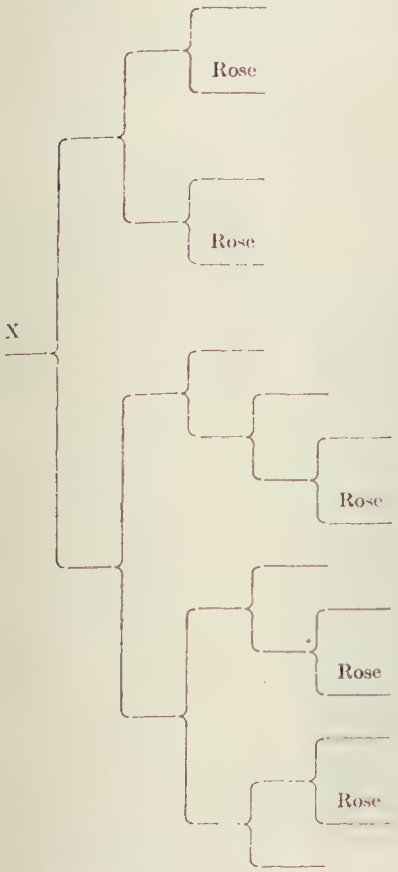
Line-breeding results from mating animals so that their descendants will be kept closely related to some ancestor regarded as unusually desirable. It bears a good reputation amongst

breeders and in that respect is in marked contrast to inbreeding. It is accomplished by using for parents animals which are both closely related to the admired ancestor, but are little, if at all, related to each other through any other ancestors. Line-breeding achieves the maintenance of close relationship to an admired ancestor whilst avoiding close inbreeding. The difference between line-breeding and inbreeding is demonstrated by the two pedigrees set out below.

Pedigree of Regal, the product of a sire-daughter mating. Regal is 25 per cent. inbred.



Pedigree of X illustrating line-breeding to Rose. X is only 4·7 per cent. inbred.



Crossbreeding

Crossbreeding in the strict sense is the mating of two animals, both purebred, but of different breeds. More commonly the term is applied to the mating of animals of different breeds whether they be purebred or not.

In dairy cattle, crossbreeding may be practised for a number of purposes. For example, it may be desired to change the size of animals by mating large and small breeds. Vigour may be improved by crossing a hardy breed with a more delicate type. The crossbreeder may plan to alter conformation toward or away from the beef type or, most commonly, to change the milk yield and butterfat percentage in the milk.

There may also be an additional motive, for the idea that crossbred animals, by virtue of their hybridity may surpass the butterfat production of both parental breeds, has captured the imagination of breeders of commercial animals. This phenomenon of hybrid vigour, or heterosis, has been exploited by plant breeders in the United States of America, where hybrid corn, bred by crossing inbred lines has given spectacular increases in yield. Further, well-confirmed experiments have demonstrated that, with poultry and pigs, a worthwhile degree of hybrid vigour is gained in such characteristics as vitality (as measured by percentage raised of those born), size, growth rate, and fertility. Unfortunately, however, there is no such certainty that a large amount of hybrid vigour results from the crossbreeding of dairy cattle.

At research stations in various overseas countries, attempts have been made to demonstrate hybrid vigour in dairy cattle. The usual technique has been to cross registered production-bred cattle of different breeds and then compare the production records of the purebred dams and their crossbred daughters. Such experiments are necessarily long-term and are difficult to conduct effectively. The results obtained to date indicate that although there is some evidence that hybrid vigour does exist in dairy cattle, it is probable that its effects on a process as complex as milk production will not be spectacular.

Consequently, dairy farmers should not expect to rear high-producing crossbreds from inferior purebreds. Under the same

Section of a mixed herd with Jersey-Ayrshire crossbred cows predominating.

environmental conditions the average production of a group of crossbreds will approximate the average of the two groups of foundation purebreds. Too frequently, a farmer having a good herd of one breed decides to crossbreed, but through buying an inferior bull of a second breed, destroys the work of years of constructive breeding.

The standard warning against crossbreeding of dairy cattle is that, if Friesians (high-milk yield—low-butterfat test) and Jerseys (low-milk yield—high-butterfat test) are crossed, the resulting cows may produce Friesian quality and Jersey quantity of milk. While this could occur in isolated cases the chances of obtaining Jersey quality and Friesian quantity milk are as likely as the reverse, and it can normally be expected that most of the offspring will produce at an intermediate level in both milk yield and percentage of butterfat.

Crossbreeding Plans

The farmer who embarks on a programme of crossbreeding is soon confronted with the problem of what mating policy to follow with the crossbred animals.

Four main alternatives are available :—

1. Cross the hybrids.
2. Back-cross to either parent breed.
3. Criss-cross using each parent breed alternately.
4. Triple-cross, using a third breed.

A typical Jersey-Shorthorn crossbred cow.

1. The practice of mating a crossbred bull with crossbred cows is not often followed. Provided the bull was carefully selected for butterfat backing, satisfactory results might

(continued on page 356)

WHEY FAT RECOVERY

By H. J. MEHARRY, Dip.Dy.M.A.C., Cheese Instructor

Investigations over the past year have shown that the cheese industry in Victoria is losing a considerable sum of money, due to inefficient methods of recovering butterfat from the whey resulting from cheese manufacture. The object of this article is to indicate the magnitude of this loss and to suggest how it can be avoided.

RECOVERY of butterfat from whey is accomplished by collecting and efficiently separating all the whey that is removed, or escapes from the cheese vats and presses during the running, drying, and subsequent operations.

In most dairying countries whey fat recovery (W.F.R.) is expressed as a percentage of the total butterfat used for cheesemaking. In this country we standardise our cheese for local sale; therefore, the total butterfat used in cheesemaking in our case would be calculated from the test of the milk in the vat just before setting and not from the total butterfat received over the factory stage or platform.

In an efficient and well-run dairy factory the W.F.R. should be approximately 6 per cent. for factories using a pasteurizer and somewhat higher for those using unpasteurized milk. The only authoritative work published on whey fat recovery is by Dr. F. H. McDowall, Dairy Research Institute, Palmerston North, New Zealand. One American authority quotes his figures and from tests conducted here in Victoria, it would appear that Dr. McDowall's figures could also be taken as a standard for this country. Dr. McDowall tested a large number of individual vats in different factories in different parts of New Zealand to ensure that his results would be truly representative. Altogether, 437 vats having butterfat tests ranging from 3 to 5 per cent. were studied. The results were averaged and presented in the following manner to show W.F.R. from the whey produced at different stages of the cheesemaking process :—

W.F.R.	%
At running	= 5·29
From draining to milling ..	= 0·09
From milling to salting ..	= 0·03
From salting to pressing ..	= 0·18
From pressing	= 0·59

It will be seen that of a total W.F.R. of 6·18 per cent., approximately 5 per cent. is recovered from the whey at running and and 1 per cent. is recovered from whey saved during the subsequent operations. It is interesting to note that at one factory where the writer collected and tested the press whey for fat it represented a saving on to-day's prices of approximately £1 per press per day.

In New Zealand the Whey Fat Recovery averages 5·5 to 6 per cent. and is published in the balance-sheet of every dairy company. This balance-sheet is a standard one laid down by the Government and every company must adhere to it. Thus it is a simple matter to compare the balance-sheet of one year with the next, or of one company with another. This results in a very keen and healthy competition among the dairy factories.

In the writer's experience, it has been found that a W.F.R. of 6 per cent. is about the maximum that can be efficiently obtained from pasteurized milk. Unpasteurized milk has a higher W.F.R. The reason for this is that the pasteurizer breaks up the clumps of fat globules, spreads them more evenly throughout the milk, and in effect, acts as a partial homogeniser, thereby reducing the amount of fat lost from the curd into the whey.

When the W.F.R. is higher than 6 per cent. one finds that there is also a corresponding loss of casein and milk solids, with a resultant loss of yield. Provided all the whey is being saved and separated, the W.F.R. figure should therefore give the manager a good guide as to whether his cheese is being manufactured properly.

In checking Whey Fat Recoveries at Victorian cheese factories my experience so far has been that the W.F.R. varies between 1 to 3 per cent. with an average of approximately 2·5 per cent. This has been brought about by several causes, the principal of which are shown on the following page.

(1) Insufficient attention is being given to the degree of efficiency achieved. It is only in latter years that we have practised separating the whey for butterfat.

(2) During the post-war years, shortage of staff has made it very difficult to give whey separation the attention it deserves.

(3) Storage space for the sweet whey before it is separated is totally inadequate.

Taking a W.F.R. of 2·5 per cent. as the average for Victoria, it is a simple matter to ascertain what the probable loss of fat (i.e., 3·5 per cent. of the fat used for cheesemaking) means to the dairying industry.

The loss sustained by an average dairy factory per 1,000 tons of cheese produced with a yield of 2·55 lb. cheese per lb. butterfat is arrived at as follows :—

Lb. fat used for cheesemaking $= \frac{1{,}000 \times 2{,}240}{2{\cdot}55}$
$= 878{,}431$ lb.

Therefore the recoverable fat which is lost in the whey is .. 3·5 per cent. of 878,431 lb.
$= 30{,}745$ lb. fat

At a price of 3s. 6½d. per lb. for whey fat, the value of the fat lost in the whey per 1,000 tons of cheese is therefore approximately £5,444.

As Victoria produces about 22,000 tons of cheese a year, the industry is losing about £120,000 per annum in unrecovered whey fat.

Most factories in Victoria separate only the whey saved at running and, due to inadequate plant, such as whey launders being too small, sweet whey tanks of insufficient holding capacity, pumps of insufficient capacity, leaking joints, and inefficient separators, quite a large proportion of this whey runs to waste as well.

Summary

The cheese industry of Victoria is losing too much money due to inefficient methods of whey fat recovery.

The solution to the problem lies in providing adequate plant and developing a greater interest in this ready source of additional profits. A stainless vat should be provided to hold the small quantity of whey not separated towards the end of the day's "make". This whey can then be mixed with the next day's whey and separated with it.

ESTABLISHMENT AND IMPROVEMENT OF A DAIRY HERD—(*continued from page 354*)

be obtained. The limited amount of experimental information available indicates that, amongst the second generation of crossbreds, no unduly great degree of segregation into low-milk yield—low-butterfat test or high-milk yield—high-butterfat test types, need be expected. However, if followed to its conclusion, this policy would constitute an attempt to form a new breed, a project in which success would certainly elude the small breeder.

2. Backcrossing is the mating of the crossbreds back to a bull of one of the parent breeds. The choice of this breed will depend on the objective of the farmer as regards size, butterfat test, or beef type, and on the availability of a superior bull of one of the pure breeds. Backcrossing is, in effect, a grading up of the crossbreds to a pure breed.

3. Criss-crossing involves alternate use of bulls of the two parent breeds. Thus, cows produced by crossing breeds *A* and *B* would be mated back to *A*. Their daughters (carrying 75 per cent. of *A* blood) would be mated to a bull of breed *B*, and so on. Such a plan involves keeping bulls of two breeds and possible benefits must be assessed against the added cost of bull purchase and maintenance.

4. Triple-crossing is a scheme under which the crossbreds *AB* would be mated with a bull of a third breed, *C*, and succeeding generations would be mated to bulls of breeds *A*, *B*, and *C* in rotation. Such a scheme for breeding dairy cattle appears to have little in its favour, as it would be necessary to have available at any one time, bulls of two or even three breeds. It is sufficiently difficult for a farmer to locate a source of high-quality bulls of a single breed—the gamble is greatly increased if the search must be extended to two or three breeds.

Summary

The predominant practice in dairy herds will continue to be outcrossing. By ignoring blood lines this allows all selective power to be placed on production backing.

In-breeding may occasionally be justified by the presence of an outstanding proven sire, whilst line-breeding is of importance only in stud herds.

Crossbreeding may validly be practised for a number of purposes, but in instituting a crossbreeding programme the main consideration should be the butterfat backing of the animals of the two breeds used.

LIVE STOCK NOTES

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

IMPORTS OF CATTLE AND SHEEP

THE 228 Santa Gertrudis cattle imported from U.S.A. to establish this new breed in Australia, and of six Friesians for the first annual sale of the Victoria Branch of the Friesian Cattle Club, formed the bulk of stock imported during 1952–53, when 267 cattle and 136 sheep were brought into Victoria from overseas. The animals imported were fewer than in some previous years due to restrictions caused by the occurrence of foot and mouth disease in the United Kingdom and to the embargo upon the importation of sheep and pigs from the United Kingdom. No pigs or goats were imported last year.

Details of the numbers of cattle and sheep of the various breeds imported to Australia last year were as follows :—

Breed.	Males.	Females.
CATTLE.		
From United Kingdom—		
Aberdeen Angus	3	1
Ayrshire	1	2
Friesian	1	..
Hereford	4	6
Red Poll	..	1
Shorthorn	2	5
From United States of America—		
Santa Gertrudis	27	201
From New Zealand—		
Friesian	3	10
SHEEP.		
From New Zealand—		
Border Leicester	2	..
Cheviot	1	29
Corriedale	2	27
English Leicester	2	8
Romney Marsh	1	41
Ryeland	1	..
South Down	1	21

[A.C.T.H.]

FEEDING PIGS WITHOUT MILK

In the absence of separated milk, pigs should receive ¼ lb. of meat-meal per head daily, irrespective of their size, from weaner to baconer weight. The same quantity ¼ lb., should also be given to dry sows, and 1 lb. daily to sows with litters. These quantities will balance all the cereal grain or meal that the pigs can eat, which will be approximately 1 lb. daily for every 25 lb. live weight of growing and fattening pigs, or ¼ lb. for each week of their age. Once the pigs are receiving all they can eat, their daily grain allowance should be increased by ¼ lb. per pig every week.

The above quantities are a general guide, but actual requirements will vary with the individual, which means that the feeder must use his discretion.

Breeding sows should be given enough grain to keep them in right condition.

In addition to the grain and meat-meal, the pigs should get one of the following :— green pasture, hand-fed greenstuff, lucerne chaff or hay, or meadow chaff or hay, or cereal chaff. These foods are listed in their order of preference.

A further supplement of four parts of ground limestone (carbonate of lime) and one part salt should be given to the above diet either as a self-fed lick or mixed in the cereal foods at the rate of 1 oz. daily for each growing pig or dry sow, and 2 oz. daily for each sow suckling a litter.

Half a gallon of separated milk will replace a ¼ lb. of meat-meal in the diet described above, and, as meat-meal is in limited supply, meat-meal should be used carefully, and then only when there is less than half a gallon of separated milk available daily for each pig.

[L. A. Downey, H.D.A., Pig Expert.]

GREENFEED FOR POULTRY.

Greenfeed is essential for health and production of poultry. Supplies are usually scarce at this period of the year, and vitaminized oils are used to supplement the greenfeed ration.

The intensive system of rearing chickens has spread considerably in recent years, and under it birds are deprived of natural range, which normally provides greenfeed in addition to minerals, worms and insects. These foods are partly provided by feeding ample quantities of fresh young greenfeed to birds kept in confinement.

Some greenfeeds are more palatable than others, and when fed separately are readily consumed, whereas those not so palatable must be incorporated with the mash in order that the birds will eat the required quantity.

Lucerne, which is not eaten by fowls as readily as most other greenfeeds, is apparently unpalatable, and should be incorporated with the mash.

Coarse, fibrous greenfeed is indigestible to poultry. The vitamin and protein content is low. Although greenfeed is fed primarily for its vitamin content, good quality materials such as green, succulent grasses, clovers and lucerne, contain an appreciable percentage of protein, minerals and other nutrients.

Cabbage and cauliflower leaves cause an undesirable flavour in eggs when fed to excess. Marshmallows cause discoloured yolks and whites and should be avoided when depending upon natural grasses and weeds for greenfoods.

Lucerne, barley, oats, wheat, millet and maize, should be cut when half-grown, otherwise they will be too fibrous, and fill the crop, gizzard and intestines with indigestible, innutritious food.

Mash consumption is reduced when greenfeed is eaten to excess. This may cause a drop in production because of the lack of room for essential nutritious foodstuffs. It is advisable, therefore, to limit the quantity of digestible greenfeed in the mash to 15 per cent., and feed additional supplies at mid-day, and after the evening grain, if supplies of greenfeed, and time, permit.

Mixed grasses and clovers make an excellent greenfeed for poultry, but the yield is very low during winter. Oats should be planted in the early autumn to make up for the shortage during that period.

Less labour is involved in feeding grasses and clovers as they are fed direct from the mower, whereas oats and most other greenfeeds need to be chaffed before being fed. Mown grass and clover lawns around the farm give a tidy appearance.

For poultry farmers who desire to grow mixed grasses and clovers for feeding, the following seed mixture is recommended for sowing :—

Poultry Lawn Mixture.

Perennial rye grass, 65 per cent. or 50 lb. to the acre.

Brown top, 14 per cent. or 10 lb. to the acre.

White clover, 7 per cent. or 5 lb. to the acre.

Subterranean clover (equal parts Mt. Barker and Bacchus Marsh), 14 per cent. or 10 lb. to the acre.

Superphosphate, 2 bags to the acre.

Sow the above mixture at the rate of 1 oz. of seed per 5 square yards mixed with superphosphate at the rate of 1 oz. per square yard. The mixture should be sown in the autumn or early spring. The seed is sown evenly on a weed-free surface and raked in lightly. The lawn surface should be left as level as possible to facilitate mowing. The perennial rye grass will make necessary the use of a sharp and well-set mower. The high feeding value and yielding capacity of this grass compared with the finer lawn grasses justify its inclusion in the mixture.

[M. D. Hall, Poultry Expert.]

PURE-BRED BULL DISTRIBUTION PLAN

The big decrease in the number of applications for the purchase of bulls through the Pure-Bred Bull Distribution Plan suggests that fewer people are taking up dairy farming. Primarily, the plan is designed to assist persons commencing dairy farming and in need of finance to buy a good bull.

At the beginning of 1953, the price paid to breeders for bulls was increased and since then breeders have made sufficient bulls available to meet the demand. The average butterfat production of the dams of the 98 bulls sold through the plan fell to 417 lb. during 1952–53 from 437 lb. during the previous year when 111 bulls were sold, but the average is high, considering the young age of so many of the dams.

The highest yielding dam was the Red Poll "Maryville Etna," owned by Mr. F. T. Butcher, Swan Hill, and which produced 672 lb. of butterfat. Next highest was the Jersey, "Eurarie Madeira Silvermine," owned by Mr. J. A. Till, Tongala, and which produced 592 lb. of butterfat.

Since the inception of the plan in 1927, 3,194 bulls of which 75 per cent. were Jerseys, have been distributed through it. Particulars of the plan are available on application to the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Details showing the numbers of bulls, their ages, together with the butterfat production and ages of the dams of the bulls for each breed, are set out in the following table.

BULLS SOLD UNDER THE PURE-BRED BULL DISTRIBUTION PLAN 1952–53.

Breed.	Jersey.	Dairy Shorthorn.	Red Poll.	Friesian.	Australian Illawarra. Shorthorn.	Guernsey.	Ayrshire.	Total.
Number of bulls	68	7	5	7	6	3	2	98
Number of Bulls.								
Age of Bulls—								
Under 3 months	2	..	..	..	..	..	..	2
3 to 6 months	5	1	2	1	2	1	..	12
6 to 9 months	14	3	2	1	1	..	..	21
9 to 12 months	17	2	1	..	2	1	2	25
1 to 2 years	26	1	..	5	1	..	..	33
2 years and over	4	..	..	..	..	1	..	5
Average age (months)	12	8	6	11	8	16	10	11
Number of Dams.								
Production of dams (lb. of butterfat)—								
Under 300 lb.	3	1	..	1	3	..	..	8
300 to 400 lb.	14	2	2	3	..	1	2	24
400 to 500 lb.	40	4	2	2	3	1	..	52
500 to 600 lb.	11	..	..	1	..	1	..	13
600 lb. and over	..	..	1	..	..	..	..	1
Average production of dams (lb. of butterfat)	436	392	449	396	357	435	369	417
Number of Dams.								
Age of dams (Class)—								
Junior 2-year-old	5	1	1	2	..	..	1	10
Senior 2-year-old	8	..	1	..	2	..	..	11
Junior 3-year-old	6	1	..	1	..	..	..	8
Senior 3-year-old	10	..	..	1	2	1	1	15
Junior 4-year-old	6	..	..	..	1	..	..	7
Senior 4-year-old	6	2	1	..	..	1	..	10
Mature	27	3	2	3	1	1	..	37

[A.C.T.H.]

(continued on page 361.)

Breeding for Egg Quality

By I. J. STEWART, B.Agr.Sc.,
Live Stock Research Officer

State Research Farm, Werribee

LEADERS of the poultry industry in recent years have been concerned about the poor keeping qualities of eggs. The quality of eggs after storage depends mainly on the amount of moisture that has been lost. As moisture is lost through the tiny pores in the egg shell, keeping quality depends largely on the porosityof the shell, porous shells resulting in high moisture loss and a poor quality product.

Each year since 1950, at the State Research Farm, Werribee, there has been a programme of testing and selection among pullets of the White Leghorn and Australorp breeds for improved egg quality. In 1951, selected hens from these families were used for breeding to produce pullets which in turn were tested.

It is too early yet to publish results of these trials, but, because of the practical interest in the subject, it is worthwhile noting some of the pointers.

The shell quality of eggs laid by an individual bird is an inherent character in that bird. If it lays eggs of good shell quality, it will continue to do so, so long as feeding and management are suitable, whereas the bird that has inherited the character of poor shell quality will lay that sort of eggs even under the most favourable conditions.

Factors other than the inherited characteristic which have an effect on shell quality are feeding, temperature and disease. To enable her to lay good quality eggs, it is necessary for the hen to have an adequate supply of good quality shell grit and vitamin D3 as well as all the other food required for egg production. High temperatures, as in summer, will reduce the quality of eggs, but hens which have inherited the ability to produce good-quality eggs will still do better than those with inherited poor quality.

A Solution

The practical solution to the problem of poor quality eggs is to feed laying hens properly and then breed only from those hens that lay good-quality eggs; in other words select the eggs that go into the incubator. Better still, select the eggs when they have been in the incubator for 12 to 14 days and have had a chance to show their rate of moisture loss by the size of the air cell. Eggs that show relatively small air cells at this stage should be kept apart for hatching and the resulting chickens branded as a nucleus of breeding stock. While it is possible to exclude obviously thin-shelled and porous-shelled eggs from the hatching trays, this method of selection after a period of incubation will give better results.

The Work at Werribee

Work at Werribee has consisted of taking 25 unselected pullets from each of 20 families (10 Australorp and 10 White Leghorn) and testing their production performance over a period of 10 months. A family is the progeny of hens which are sisters and half-sisters mated to a single cockerel. Testing for egg quality is done by taking a sample of eggs laid over one or two days, from each family, in autumn, winter, spring and summer. These eggs are weighed accurately and placed in an incubator running at normal incubation temperature and humidity for 12 days, then weighed again to ascertain the moisture loss. This incubation treatment gives approximately the same staling effect as six months in cool storage for unoiled eggs with the advantage of speed and ease of handling. At the end of the year the results are analysed and the families ranked in order of merit.

Records are also kept of total egg production by the families, mortality (including causes), broodiness in Australorps and any other factors. However, to date there have not been any great variations between families on these points which have been disregarded in the selection of families for breeding.

At the end of the pullet year, two or three families of each breed which have produced the best quality eggs and the same number of families which have produced the poorest quality eggs are selected for breeding. This system of breeding from the best and the worst families should, in a number of generations, show the progress that can be expected by selection for and against this character.

The method used at Werribee is too cumbersome for practical application by farmers, but, for experimental work, an exact quantitative measure of moisture loss has to be used and selection must be made both for and against the character in question in order to show the possible progress. The eggs used have of course been infertile, but fertile eggs give the same results, so that the practical method of selection by the size of the air cell during incubation is something that can be used by any breeder wishing to improve the egg quality of his stock.

LIVE STOCK NOTES—(*continued from page 359*)

BEEKEEPING

American Foul Brood

All persons owning hives of bees should be familiar with the symptoms of American Foul Brood. This matter was brought to the notice of beekeepers recently at the Victorian Apiarists' Association Conference, but those present represented only a portion of the beekeepers of this State. It is just as important for the person owning only one or two hives to be familiar with the ravages and symptoms of this disease as it is for the commercial beekeeper with several hundred hives. One infected hive, if neglected, may cause the disease to spread to hundreds of others. American Foul Brood can be checked with a minimum of loss if its presence is recognized in time to prevent its spread.

The apiary section of the Department of Agriculture is maintained to assist beekeepers and for the protection of the industry, but there are many more than 100,000 registered hives in this State, and it will be realized therefore that it is impossible for the inspectors to examine and continuously check all hives.

Until all beekeepers are familiar with the disease, and co-operate with the Department, foul brood eradication will be impossible. The Department of Agriculture asks of beekeepers: "Help us to help you."

A vast knowledge of apiculture is necessary for the operation of an apiary, yet many otherwise good beekeepers fall short in their knowledge by not learning more of this important disease. Furthermore, frequent examination of brood for American Foul Brood is just, or even more important than extracting honey or shifting hives, or other necessary job. If American Foul Brood spreads through the apiary, the hives become a total loss and there will be no bees to produce the honey.

A Notifiable Disease

American Foul Brood is by law a notifiable disease, yet some beekeepers, when they find it, prefer to "clean it up" themselves. Is it not better to have the assistance of experts in getting rid of it with a minimum of loss and at the same time keep within the law? This is a free service, and beekeepers are urged to avail themselves of it if they think they may have American Foul Brood in their hives. If any doubt exists, they should notify the Chief Veterinary Inspector, Live Stock Division, Department of Agriculture, Melbourne, C.2.

Like a cold in the head, American Foul Brood is not a disgrace. It *is* a disgrace, however, and a violation of the law, to have it and *not* notify the Department of Agriculture.

Free pamphlets and advice on the symptoms and causes of American Foul Brood are available on application to this Department.

[C. D. Ilton, Apiary Inspector.]

STORAGE OF TABLE POTATOES

"Pitting"—Sprout Prevention

By G. H. MATTINGLEY, Potato Expert

IN Victoria, early potato crops, which cannot be stored for long because of the immature state of the tubers, and some of the midseason crops, are sold from the paddock, thus avoiding the need for storage on the farm. However, from May onwards in normal years growers are faced with the necessity of storing portion of their product on the farm until later in the season.

Potato storage " pits."

If only for a limited period, table potatoes may be stored satisfactorily in bags in any dry, sheltered situation, provided steps are taken to exclude light and to ensure adequate ventilation. Potatoes may be stored for extended periods in " pits," which are covered heaps built on the surface of the ground.

Making a Pit

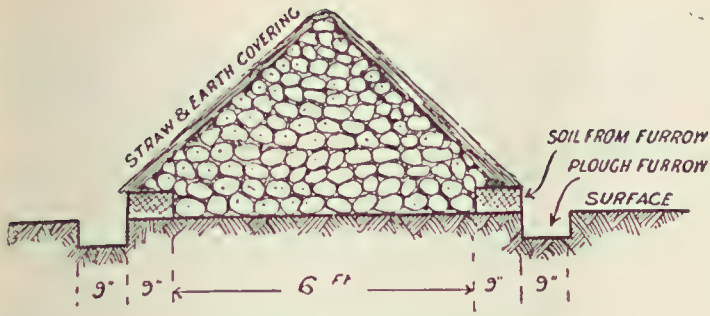
The site for the potato pit should be well-drained, and consideration should be given to its suitability as a location from which the tubers will be loaded for market. A convenient width is from 6 to 8 feet and an effective way of framing this area is to plough inwards two parallel furrows so that the required width lies between them. The sods from the furrows act as checks which determine the size of the pile, while the furrows facilitate drainage. Logs or 6 x 1 hardwood planks set on edge are also suitable for forming the boundaries of the pit. The length will depend on the tonnage of potatoes to be stored.

The potatoes should be built up as steeply as convenient—an angle of about 45° is practicable. As the pit progresses the sides and end of the heap should be covered with a layer of straw about 4 inches deep. A capping of straw placed across the ridge so that the ends overlap the straw at the sides will shed any rain. Rye or wheat straw—or reeds when available—are preferable to oaten or barley straw; they are not so likely to consolidate and restrict the ventilation so essential for safe storage.

The thatch may be secured against wind by a light covering of soil, or by pieces of timber. If soil is used it should be placed no higher on the sides of the pit than 9 inches from the top of the ridge on either side. For small lots of one ton or less, the pit may be made with a circular base, and built up as high in the centre as the base will permit.

Sprout Prevention

During recent years, attention has been focused on the prevention of sprouting in stored table potatoes by certain plant growth-regulating substances.



Cross section of potato "pit".

Several materials have been tested under local conditions and it has been found that one containing 2·4 per cent. isopropyl phenyl carbamate as the active principle has given particularly good results. With this substance, sprouting has been prevented and loss in weight has been reduced very considerably in all the main commercial varieties during a six-month storage period.

Other advantages such as the maintenance of quality and palatability of the tubers combine to make the use of this material attractive where table potatoes are to be stored for long periods. It would make practicable the storage of potatoes in glut periods to alleviate end of season shortages. This material is not suitable for application to seed potatoes.

Storage Losses

It is important that growers should know the chief causes of waste in storage, so that they may be avoided. Potatoes should be carefully picked over and all diseased tubers removed before being stored. If diseased potatoes are mixed with sound ones, the higher humidity within the stack favours the development and spread of disease organisms to the surrounding healthy tubers.

Sweating and heating will occur if potatoes are stored in heaps so large that air cannot circulate between the tubers. The risk of loss from this cause is greatest with immature tubers, therefore potatoes intended for storage should be fully mature before lifting.

Rotting will probably occur in potatoes stored in a wet condition or those which have become wet during storage, owing to inadequate cover. As potatoes are easily damaged by even a light frost, every precaution should be taken to protect them after harvest and during storage. Frosted potatoes are unfit for human consumption.

Boiling Water in the Dairy

Many of the defects in cream arise through lack of proper cleansing of dairy utensils. Proper cleaning involves the provision of adequate supplies of boiling water, which, in addition to cleaning the utensils, also destroys germs responsible for cream defects. A utensil may appear to be clean, yet the cream from that farm is being graded down at the butter factory. There is obviously something wrong, and more often than not the trouble is due to *inadequate* cleansing of utensils. Cloth or brush cleaning alone will not remove invisible, harmful bacteria; to do this, either boiling water or steam is essential. The following recommendations, if properly carried out, will go a long way towards the production of better quality cream on many farms.

In cleansing utensils, first free them from deposits of milk solids and other dirt, and then from bacteria by subjecting to heat treatment. Cleansing is best effected by rinsing in cold or luke-warm water, then scrubbing with a brush, inside and out, in hot water to which a little washing soda has been added. The washing soda emulsifies the grease and aids in its removal.

The reason why cold or luke-warm water is used first on a milky vessel, in preference to hot, is that boiling water will make the albumen in the milk stick tenaciously, giving the tinware a mottled, scaly appearance. Always complete the cleansing process with a thorough rinsing and scalding in boiling water. Where steam is available, put the utensil over a steam jet for two to three minutes.

After the utensils have been sterilized with boiling water or steam, they should be placed in clean racks where they will dry quickly. Such utensils should never be dried with a cloth. After cleansing they should be stored in a clean place unexposed to dust and flies.

[Contributed by the Dairying Division.]

Chemical Control of Insects and Mites

By T. W. HOGAN, M.Agr.Sc., Senior Entomologist, Biology Branch

III. The Acaricides

Parts I. and II. of this series of articles on the Chemical Control of Insects and Mites appeared in the October and December, 1952, issues of the *Journal*

IN recent years the control of mites attacking horticultural crops has become one of the most important problems in the fruit and vegetable country. The rise in the status of mites as pests has been associated with the use of the new organic insecticides, particularly DDT, which are not only ineffective against many species of mites, but destroy many of the valuable predators and parasites normally keeping the mite in check. The result has been that many of the control programmes using such materials as white oil emulsion, lime sulphur, wettable sulphur, and winter oils have been insufficient to cope with the greatly accelerated rise in numbers.

No marked advances in mite control to correspond with those which took place in insect control, occurred until the advent of parathion. This material proved not only a good insecticide, but also an excellent acaricide and came into general use for the summer control of mites; it is still the principal material used for this purpose in Victoria to-day.

Parathion has a number of disadvantages of which the most serious is its high toxicity to warm-blooded animals. In addition, it has a comparatively short residual effect, and as it is not ovicidal, two successive sprays are often required to achieve satisfactory mite control since eggs may hatch after the first spray has lost its effect. Furthermore, there have been reports of strains of mites resistant to parathion both with aerosol applications in glasshouses and in orchards.

A more recent development has been the discovery of the systemics, Schradan and Systox, and these are still probably the most efficient acaricides known. But these, too, have a high toxicity to mammals, and the fact that they are absorbed into the plant and cannot be removed, except by lapse of time, has caused considerable concern to the Health Authorities, who have not permitted their use commercially in Australia. In any case, the high cost of these materials imposes a limitation.

The lack of a completely satisfactory acaricide for summer control of mites, has led to intensive research for better materials, particularly in U.S.A.

The result has been that a series of highly efficient acaricides are now appearing, most of them free of the disadvantages associated with the early phosphates.

General Properties

The new acaricides vary in their mode of action. They may be effective against the active stages of the mites only, against the eggs, or even summer eggs only, while a few are effective against all stages. Little or no fumigant action has been reported with the majority of them. All have persistent residues to some degree and the most promising ones have the very important feature of low toxicity to warm-blooded animals. A rather surprising fact is that some of them are not only specific to mites, but also to particular mites.

Some of the new materials, because of lack of effect on adults, or slowness of action, are unsatisfactory for the control of heavy infestations because of the delay before full control is achieved. Such acaricides are better used as preventive sprays, and can be incorporated in an insecticidal spray where a regular schedule of such sprays is used.

Phytotoxicity

In a general way it can be said that any new acaricide will not become available commercially unless it has a satisfactory record of freedom from damage to plants when used at the recommended strengths. On the other hand, practically all of them have had some phytotoxic effects reported; sometimes on particular species or varieties of plants, other times under special climatic conditions. Therefore, although it can be assumed that these materials are not severely phytotoxic, caution should be observed whenever one is used in a district for the first time.

The following list of acaricides includes those already available commercially and others which are expected to be available in the near future.

Aramite (88.R.) *para tertiary butylphenoxy isopropyl chlorethyl sulphite*

A brownish liquid formulated as a wettable powder or emulsive. Aramite has given outstanding results against citrus mites in American trials, but is reputed to be poor against bryobia mite (*Bryobia praetiosa* Koch).

It is specific to mites, having little or no action against insects, beneficial or otherwise, and may take about four days to take full effect, particularly when used at the lower concentrations. Only the active stages of the mites are killed. The residue is persistent and remains effective for several weeks.

Aramite has low toxicity to warm-blooded animals, has a satisfactory record as far as phytotoxicity is concerned, and is compatible with most agricultural chemicals, sulphur being one important exception.

Azobenzene ($C_{12}H_{10}N_2$)

Azobenzene is an orange red crystalline solid, and has proved a highly satisfactory ovicide for mites in glasshouses, used as a smoke or low vapor pressure fumigant. Recently there have been reports of strains of mites resistant to this material and as it is apt to injure plants, it appears likely that other materials will replace it in the future.

Dimite

The formulated product of *DMC, di (para chlorophenyl) methylcarbinol*, Dimite is a white crystalline solid. It is an analogue of DDT but, unlike DDT, is an efficient acaricide, in fact, it is regarded as the most efficient of the non-systemics. Unfortunately, it is difficult to manufacture and, therefore, very expensive. It is an ovicide, and in tests has given control of red spider eggs at a concentration of 0.0125 per cent.

In a general way DMC is safe to use on plants, but like DDT, affects cucurbits and is reported to injure citrus at high temperatures. Only moderately toxic to mammals and compatible with most agricultural chemicals; stable in the presence of alkali, but unstable to acid.

DNOCHP (*dinitro ortho cyclohexyphenol*)

DNOCHP is a yellow solid usually formulated as the dicyclohexylamine salt, e.g DN–111. Although highly efficient against most mites and only moderately toxic to mammals, this material has very little margin between effective dosage for mite control and damage to plants.

DCPM (K1875) *bis (para chlorophenoxy) methane*

DCPM is a whitish solid formulated as a wettable powder known as *Neotran*. Its principal application has been for citrus mites against which it is toxic to both eggs and adults, but is stated to be much less satisfactory against bryobia mite. An important property is its extremely low toxicity to mammals; reported to be one-tenth that of DDT.

DPS (*Diphenyl sulphone*)

DPS is one of the materials tested by English workers and found effective against both egg and adult stages of the European red mite (*Paratetranychus pilosus* (C and F); but the same workers showed PCPBS (q.v.) to be superior. As DPS is also somewhat phytotoxic it is likely to be exploited commercially only if some special property is found or the formulation improved.*

EPN (*Ethyl para nitrophenyl thionobenzene phosphonate*)

An organic phosphate and, like most of this group, possesses both insecticidal and acaricidal properties. EPN has proved an outstanding residual acaricide, for certain species of mites, but is poor against bryobia. Its toxicity to mammals is rather higher than most of the other materials and it can be absorbed by inhalation or by skin contact, thereby adding to its dangers. Some phytotoxicity has been reported on apples and cucumbers but, in general, it is not regarded as unduly phytotoxic. Compatible with most agricultural chemicals, but unstable in alkali.

* Products with satisfactory formulations have appeared since this paper was written.

Despite very good acaricidal properties, it appears less promising than several other materials.

Genitol 923 (*dichlorophenyl benzenesulphonate*)

Genitol 923 is still in the experimental stages and, although results have been poor on some species of mites, it is of interest in having given good control of bryobia when used as a preventive spray.

Malathon (Compound 4049) (*dimethyl dithiophosphate of diethyl mercaptosuccinate*)

Malathon is a brownish liquid formulated as a wettable powder or emulsive. A recently developed acaricide and one of the most promising. It is characterized by particularly long residual effect reported to be even longer than that of Ovotran (q.v.). Malathon is not specific to mites, but is also effective against some aphids and other insect pests.

Its toxicity to mammals is low, does not harm plants at normal concentrations and has good compatibility with other agricultural chemicals except that it is unstable in alkali, and should not be used with Bordeaux mixture.

Although still in the experimental stages, sufficient is known about it to indicate that it will be important commercially in the near future.

Ovotran

Ovotran is the formulated product of K6451 (para chlorophenyl parachlorobenzene sulphonate). A specific acaricide characterized by long residual action reported to be of three to five weeks' duration. Ovotran, as the name implies, is primarily ovicidal, but is reputed to kill other stages at higher strengths.

The initial effect after application is delayed because of the slow and incomplete kill of adults, and where heavy infestations are present admixture of a quicker acting material may be desirable. Effective against most mites including bryobia and comparatively harmless to beneficial insects. In general has a good record of safety to plants when used at appropriate strengths, very low toxicity to mammals and compatible with most agricultural chemicals. Unlike many of the others it is stable in the presence of alkali.

Ovotran can be regarded as one of the most promising of the new acaricides because its long residual action and efficient ovicidal action gives an excellent final clean up of mites despite the initial slow effect. It is comparatively cheap and is in general use in U.S.A.

PCPBS (*para chlorophenyl benzene sulphonate*)

PCPBS is closely related to K6451 in chemical structure and, like that product, is mainly ovicidal, but is effective against the summer eggs only. English research workers report that it can kill eggs on the opposite side of the leaf to that to which the spray is applied. They state that the residual action continues for about fourteen days. Most of the work has been in connection with the European red mite, (*paratetranychus pilosus* (*C. and F.*)) but it has also been shown to be effective against some other species, but very little appears to have been done against bryobia mite.

It is compatible with most other agricultural chemicals and extremely low in toxicity to mammals. Its chief disadvantage appears to be its initial slowness to show effect and, for this reason, it is best used as a preventive spray, or with the admixture of a quick acting material if a heavy infestation is involved and can be regarded as having, very similar to Ovotran, great promise, but little is known as yet about its performance against those mites of special interest in this State.

Sulphenone

Sulphenone is the formulated product of Compound R242 (para chlorophenyl phenyl sulphone.)

This acaricide is effective against a wider range of mites than most of the others. While regarded as being ineffective against insects some results in experimental plots are taken to indicate that it is toxic to mite predators. It is effective against the active stage of the mites, is slow acting, but has a very persistent residue.

While not the most potent acaricide in the terms of actual quantity of active ingredient required, its cost is low and it may be economic to apply a greater amount to achieve the same effect. Bryobia mite is one of those controlled by this material. It is safe to use on plants at the recommended strength, has low toxicity to mammals and good compatibility with agricultural chemicals.

Amongst materials effective against both mites and insects is *chlorthion*. This is an organic phosphate related to parathion, but much less toxic to mammals. Although still in the experimental stages it shows considerable promise.

PARASITES OF CATTLE

Internal and External

By the Veterinary Staff, Live Stock Division

Young cattle are very susceptible to attack by parasites, a risk that may be reduced by timely drenching and grazing the stock on clean, regularly-spelled pastures.

WORMS are much more detrimental to the health of cattle than stock-owners generally realize. Although mortality from infestation with worms is relatively uncommon, the economic wastage due to the ravages of worms, especially in young cattle, is extremely serious. Interference with nutrition, with consequent lack of growth and development of young cattle, and digestive disturbances with loss of condition in adult cattle, are frequently the result of parasitism of the alimentary tract. Suitable treatment and the adoption of rational hygienic measures may prevent, to a large extent, the losses due to worms in cattle.

STOMACH AND INTESTINAL WORMS

One of the commonest types of worms affecting cattle is the group known as Trichostrongyles or Short Hair Worms, which includes numerous varieties of small hair-like worms which are very difficult to see without the aid of a magnifying glass. They are found in both the fourth stomach and the intestinal tract, and when present in large numbers, give rise to a condition known as Trichostrongylosis. Another type is the twisted wire worm or round stomach worm (*Haemonchus contortus*). This is the largest of the stomach worms affecting cattle, and is found in the fourth stomach, although, in cases of heavy infestation, it may be found in the first portion of the small intestine also. It is a thin, thread-like worm ½ to 1½ inches long, and the female is characterized by red and white striping of the body, giving it a twisted "barber's pole" appearance. This is due to the curling of the ovarian tubes around the blood-filled intestinal tract. Although not so common here as in the northern States of the Commonwealth, infestation with this worm has caused acute parasitic gastritis among young cattle.

The stomach and small intestinal worms of cattle have similar life histories. Each female deposits thousands of eggs, which pass out in the animal's faeces, or droppings, and, under suitable conditions of warmth and moisture, the eggs hatch out within a few hours but, in cold weather, this may be delayed for days. The small embryos, after feeding for three or four days upon the faeces, undergo certain changes, and

then ascend blades of grass and are ingested by grazing cattle. This stage is an extremely resistant one and, under favorable conditions of heat and dryness, worm larvae may survive on pastures for months, although long periods of drought and extreme cold markedly shorten the period of survival. After passing to the stomach or intestines, the larvae bore into the mucous membrane. They grow rapidly, and become mature within three weeks.

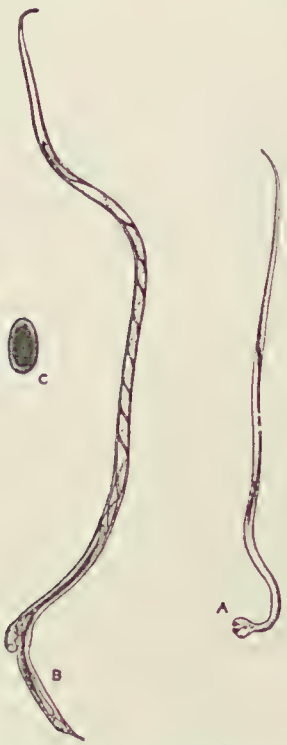
Trichostrongylosis

Trichostrongylosis, the condition caused by the short hair worms, mainly affects young cattle from weaning up to two years of age. Outbreaks usually occur during autumn, winter, and early spring. Older cattle are more resistant to these worms, but, if grazed on heavily worm-infested pastures at times when the pasture has lost much of its nourishment, trichostrongylosis may develop even in them. In young cattle affected with trichostrongylosis, the most marked symptoms are stunting of growth and scouring. Quite frequently, only certain individuals in a herd of young stock show evidence of this disease and, in addition to being under-developed, they present a dejected, unthrifty appearance, while the faeces are greenish black, liquid, and offensive. Symptoms of anaemia may not be apparent for some time, and bottling under the jaw is rarely seen. When scouring develops, condition is lost rapidly, although affected animals may linger in an emaciated condition for weeks before succumbing.

The short hair worm which causes trichostrongylosis. Natural size.
[After *Ross and Gordon.*

The Stomach (Twisted Wire) Worm

In cattle affected with the twisted wire worm, the chief symptoms are anaemia, indicated by paleness of the mucous membrane of the eyes, mouth, and vagina; dropsical swelling between the lower jaws (commonly called "bottle jaw"), loss of condition, and depraved appetite. Diarrhoea is not a regular feature. Both young and old cattle are affected, mainly in the late spring, summer, and autumn. Young cattle, if heavily infested, may succumb while still in good condition. This worm is an avid blood sucker, and the anaemia, which is a characteristic symptom of its effects, is directly due to the abstraction of blood from the lining of the stomach.



Stomach Worm. (*Haemonchus contortus.*)
A—Male. B—Female. C—Egg.

Preventive Drenching

In those parts where winter rainfall is heavy and cattle have been running on the same paddocks for some years, it is wise to anticipate outbreaks of trichostrongylosis in young stock and commence drenching in the autumn before any symptoms of the

disease appear. During the winter, another course of three drenchings is advisable and, on farms where outbreaks have occurred previously, young stock should be drenched also during early spring before the flush of the season.

Treatment

As with sheep, treatment for worms in cattle consists of drenching with a solution of copper sulphate (bluestone) and nicotine sulphate. The copper sulphate should be of good quality, and is best obtained from a chemist. The mixture consists of 2 oz. of copper sulphate, 1 oz. of nicotine sulphate, 1 gallon of water, and must be prepared in an enamel or earthenware vessel. The copper sulphate should be dissolved in about a quart of boiling water. Cold water is added to make 1 gallon, and then the nicotine sulphate is added. This quantity is sufficient to drench sixteen mature cattle. The dose required varies with the age of the animal according to the following table :—

Mature cattle	10 oz.
Yearling cattle ..	.. 6 to 8 oz.
Calves	4 oz.

On grossly-contaminated pastures, cattle will rapidly become re-infested, and, for this reason, one treatment is not sufficient. Drenching should be repeated three times at intervals of fourteen days. Starvation prior to drenching is unnecessary. After drenching, wormy cattle should be shifted to clean pasture and given a supplementary ration of concentrates to build up the constitution, which has been weakened by the ravages of the worms.

Phenothiazine Treatment

It is now generally recognized that phenothiazine is more effective for treating trichostrongyle infestation than the mixtures given above. Phenothiazine has the added advantage that it may be given either in the food or as a drench, when mixed with water.

Dosage is as follows :—

Adult cattle	1 oz.
Yearling cattle	$\frac{3}{4}$ oz.
Calf, six months old ..	$\frac{1}{2}$ oz.
Calf, four months old ..	$\frac{1}{3}$ oz.

It may be necessary to repeat this treatment after an interval of ten to fourteen days.

It has been noted that the above dose rates may be insufficient in severely-infested animals. Symptoms are temporarily alleviated, but very soon return. In such cases, the dose rate should be increased to—

Adult cattle	2 oz.
Yearlings	$1\frac{1}{2}$ oz.
Calves, six months ..	1 oz.
Calves, four months ..	$\frac{3}{4}$ oz.

These amounts, on certain individuals, may approximate the toxic or poisonous level. It is therefore recommended that these doses be divided into three equal parts, each part to be given at 24-hour intervals. For example, a yearling receiving a total dose of $1\frac{1}{2}$ oz. should be given $\frac{1}{2}$ oz. daily for three days.

Proprietary suspended solutions usually contain 50 to 55 per cent. Phenothiazine powder, and the doses should be computed as follows :—

2 oz. of powder is equivalent to 4 fluid oz. of solution ;

$1\frac{1}{2}$ oz. of powder is equivalent to 3 fluid oz. of solution ;

1 oz. of powder is equivalent to 2 fluid oz. of solution ;

$\frac{1}{2}$ oz. of powder is equivalent to 1 fluid oz. of solution ;

$\frac{1}{3}$ oz. of powder is equivalent to $\frac{2}{3}$ fluid oz. of solution.

The twisted wire worm or round stomach worm. Natural size.
[After *Ross and Gordon.*

Drenching Alternately with Phenothiazine and Bluestone-Nicotine

Drenching alternately with phenothiazine and bluestone-nicotine at weekly intervals will be effective in controlling wormy scours in young cattle which have failed to respond to either drug given alone. Dry food and warm shelter must be provided if such weakened cattle are to be saved No amount of drenching can replace lost bodily condition, and special care will be necessary to avoid stunting of young cattle showing symptoms of worm infestation.

Toxic Effects of Phenothiazine

After administration, phenothiazine changes chemically, and the substance formed renders the body sensitive to the action of the sun's rays. This condition is known as photosensitization, and is a severe sunburn.

The eyes most commonly suffer from this effect. The surface of these organs becomes bluish-white and opaque, the membranous lining of the lids appears red and inflamed, and a pus-like discharge drains away from the eyes. Affected animals are generally in great pain, and react strongly to light. In very severe cases, ulceration of the eye surface may occur, and permanent blindness may result.

To prevent the onset of photosensitization, doses should be divided as previously recommended, and drenching should only be carried out during dull weather.

Affected animals should be placed in a dark shed and provided with ample food and water, otherwise they should be left strictly alone.

NODULAR WORM

Another worm common in cattle in Victoria is the nodular worm (*Oesophagostomum radiatum*). This is a short, thread-like worm found in the large intestine. The young worms invade the bowel wall, and cause the formation of small rounded nodules. Consequently, the condition of nodular disease has become universally known as "pimply gut" or "knotty gut." The adult worms are white in colour, and vary in length from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch. This parasite has a wide distribution in Victoria, particularly in areas of high rainfall, and where irrigation is practised.

The life cycle of the nodular worm resembles closely that of the worms previously described, up to the stage when the larvae became encysted on the pasture. When swallowed, the larvae pass with the food to the small intestine, where they migrate into the bowel wall, causing nodules, which vary in size from that of a pin's head to that of a pea, and contain varying quantities of whitish or greenish pus. In these nodules the larvae undergo further development and return to the bowel after a variable period of 15 to 150 days, reaching maturity in a few days. Migrating larvae may lodge in other portions of the digestive tract, and in the liver, intestinal lymph glands, and omentum or caul, where they die.

Nodules formed in the intestine as a result of activity of the nodular worm.

Old nodules are frequently cheesy in consistency or even gritty, due to the deposition of lime salts. Normal digestive processes are greatly interfered with by the presence of nodulation. The common symptoms of nodular disease are wasting and diarrhoea. In very acute cases the animal may walk with a stiff stilted gait, particularly in the hind limbs.

Treatment

Treatment for oesophagostomiasis ("pimply gut") is not as satisfactory

as for other worms in cattle, as the main symptoms are the result of the nodulations in the bowel wall, and these nodules are not affected by drugs. The incidence of infestation on a property may be reduced, however, by the elimination of the adult worm from the large intestine of cattle with phenothiazine, thus reducing the contamination of the pasture.

LUNGWORM

Still another worm affecting cattle is the lungworm (*Dictyocaulus filaria*) which inhabits the air passages in the lungs. The lungworm has proved troublesome only in young cattle from weaning age to about eighteen months. The adult worms are white in colour and thread-like, and 1 to 4 inches in length. They are found lying coiled in tangled masses, mixed with mucus, in the terminations of the air passages, although, in heavy infestations, they may actually be found in the windpipe.

Lungworm disease is common in low-lying marshy districts of high rainfall, and in areas subject to inundation, and on poorly-drained irrigation areas. Usually, it appears in the autumn and winter when the nutritive value of pasture is at its lowest. The eggs of the lungworm are laid in the bronchi and are usually coughed up and swallowed. They hatch out in the bowel, and the embryos pass out with the faeces. After feeding for about eight days they become encysted on blades of grass, and are then ingested by grazing animals. The larvae bore through the wall of the intestine into blood vessels and are carried to the lungs in the blood. Five to seven weeks later adult worms are found in the bronchi.

In an affected herd, one first notices an odd animal coughing, especially following exertion. In the early stages the cough is short and dry, but later, often is accompanied by a discharge of mucus from the nostrils or mouth. This discharge contains ova and embryos, and frequently is swallowed when coughed into the mouth, the larvae being passed later in the faeces. The disease develops as an insidious bronchitis which may develop into pneumonia. As it progresses, affected animals may show emaciation, anaemia, dry harsh coat, hide bound, bottling of the jaw, and swelling of the dewlap. Death may result from pneumonia or exhaustion.

Treatment

Treatment with drenches has not been successful owing to the location of the parasites in the lungs. Lungworms are seldom found as a sole infestation, and are usually associated with stomach and intestinal worms. Drenching for these will greatly relieve the affected animals, and, if they are moved from the source of infection and given an abundant supply of good food, they can usually withstand the effects of the lungworm and gradually recover.

Preventive Measures

Where infestation with stomach, intestinal, or lung worms has proved troublesome, preventive measures should be adopted to protect the cattle, especially young animals. Affected animals should be removed to clean pasture and drenched at least three times at fortnightly intervals. A system of rotational grazing and spelling of paddocks, should be adopted. Horses and sheep may be grazed on paddocks being spelled. Weaner calves should not be grazed on areas which have previously been used for older cattle. Provide adequate nutrition to build up their resistance.

Overstocking should be avoided. Attention should be paid to the adequate drainage of properties, as cattle on badly-drained paddocks are much more subject to infestation with worms.

The lungworm. Natural size.
[After *Ross and Gordon*

Where strict attention is paid to these details as part of the routine management of the farm, economic wastage due to ill-effects from worm infestation will be reduced to a minimum.

LIVER FLUKE DISEASE

While the prevalence of liver-fluke diseases in sheep has been recognized for a long time, it is only in comparatively recent years that stock-owners have realized that the same fluke may cause serious trouble in cattle.

As in sheep, sudden deaths may occur in cattle from black disease which occurs only as a result of fluke infestation, or the flukes may cause more lingering sickness from their effects on the liver. Acute fluke infestation may also cause deaths.

Liver flukes (*Fasciola hepatica*) are flat, leaf-like parasites, which live in the bile ducts, where they grow to maturity and lay their eggs, which are eventually excreted in the animal's faeces. Under favorable conditions embryos hatch from these eggs and, to complete the life cycle, must enter the body of a fresh-water snail. From this intermediate host they pass on to the pasture and are ingested by grazing cattle. The complete life cycle and methods of eliminating the fresh-water snail that shelters the fluke are described fully in a pamphlet which may be obtained free of cost on application to the Department of Agriculture, Melbourne, C.2.

Liver fluke disease in cattle is very prevalent in irrigation areas and occurs also in districts receiving a heavy rainfall, especially in swampy or low-lying country.

Cattle of any age may be affected, young cattle from nine to eighteen months old being particularly subject to ill-effects from the parasite.

Cattle affected with liver fluke usually become poor and unthrifty, with a dry, staring coat. The membrane of the eyes and mouth becomes very pale, and a flabby "pouch" or "bottling" frequently develops under the jaws. The animal may gradually waste away, and it is not uncommon for the owner to suspect that it is suffering from tuberculosis. Diarrhoea also may be present.

If an animal dies or is killed and the liver examined, the adult fluke may be found in the bile ducts. These ducts become much thickened and tend to stand out as white cords in the liver surface. This condition is known as chronic fluke disease. When cut, the bile ducts are gritty. In cases of acute fluke disease, death may occur, and is due to the damage caused by the larval forms as they burrow through the liver tissue. In these cases the liver surface is found to be covered with small, cloudy-white spots about $\frac{1}{8}$ inch in diameter. Each spot marks the site of entry into the liver of a larval fluke.

Chronic and acute fluke disease can readily be differentiated from black disease, where areas of liver tissue become yellowish, softened, and necrotic or dead.

Although carbon tetrachloride has long been recognized for the treatment of liver fluke in sheep, for many years it was considered an unsafe drug for use in cattle. In recent years, however, it has been found that it is safe to use, provided certain precautions are taken.

Only cattle suspected of being actually affected with fluke should be drenched. Cattle that are apparently healthy and doing well should not be drenched with carbon tetrachloride. It is a waste of time, money, and the drug, and actually may be dangerous.

Two or three cattle only should be drenched at a time, and the drenching should be done during mild weather. Mineral deficiency may make animals more susceptible to ill-effects. Animals should not be changed suddenly to different pasture immediately before or after drenching.

Always use a drench freshly prepared by a reliable chemist. If carbon tetrachloride is to be kept from one season to the next it should be kept in a tightly-corked, dark-coloured bottle, away from the light.

Carbon tetrachloride will taint milk if given to milking cows.

The drench for adult cattle is 4 c.c. of carbon tetrachloride in $\frac{1}{2}$ pint of paraffin oil. The mixture should be well shaken before use and given carefully.

Small cows or heifers should receive 3 c.c. only of carbon tetrachloride and six to twelve months' old cattle 2 c.c. in $\frac{1}{2}$ pint of paraffin oil.

Hexachlorethane is another drench found successful in ridding cattle of fluke. Manufacturers claim that it is safer than carbon tetrachloride, although certain animals may be susceptible to its effects.

The recommended dose rate is as follows :—

Adults	2 oz.
Eighteen months old ..	1½ oz.
Yearlings	1 oz.
Calves, six months ..	½ oz.

In poor and under-sized animals, the dose should be divided into two halves, the second half being given 24 hours after the first.

This substance is a dispersible powder and, when it is mixed with water, it should be shaken vigorously just before administration.

Young stock should not be kept in paddocks where they will be re-infested with fluke, and should be fed well.

As in sheep, the presence of liver fluke in cattle may predispose the animals to black disease. This latter disease may be prevented by vaccination, the same vaccine being used as for sheep, but the dose for cattle is 10 c.c. The vaccine is injected under the skin along the side behind the foreleg. Full particulars of black disease are given in another departmental pamphlet which may be obtained free of charge on application to the Department of Agriculture, Melbourne, C.2.

HYDATID (*Echinoccus*) DISEASE

The hydatid is the cystic stage of a small tapeworm (*Echinococcus granulosus*) which lives in the small intestine of dogs and wild carnivores. The cysts are commonly found in sheep, cattle, pigs, and also in man.

Life Cycle

The hydatid tapeworm is composed of four or five segments and, when mature, attains a length of not more than one-fifth of an inch. It inhabits the small intestine of carnivores, but the domestic dog is the most important primary host in relation to cattle and human infestation. As with all tapeworms, each segment is equipped with both male and female reproductive organs. The final segment of the tapeworm becomes filled with fertilized eggs and, when mature, becomes detached and passes out with the faeces. The eggs are unable to develop any further unless they are eaten by a susceptible animal. Infestation of cattle and sheep usually occurs while they are grazing over pasture contaminated with either infected canine faeces or dust blown from the vicinity of kennels. Within the intestine small embryos hatch from the eggs, and bore through the bowel wall into the blood stream in which they are carried to various organs. These embryos grow slowly and gradually develop into hydatid cysts.

The cysts vary in size from that of a marble to that of a small orange, and are most commonly found embedded in the substance of the lungs and liver. They appear as white or yellowish-white bladder-like structures containing a clear watery fluid and numerous sago-like tapeworm heads. Hydatid cysts may persist for a considerable period, although, in cattle, they tend to degenerate when the contents of the cysts are replaced with a cheesy substance in which lime salts frequently are deposited.

For completion of the life cycle, the cysts must be ingested by a dog. This is commonly brought about by feeding dogs on raw offal containing cysts. During digestion the small tapeworm heads, which are armed with minute hooks, are freed, and they attach themselves to the mucous lining of the small intestine and grow into adult worms.

Effects and Symptoms

As the majority of the hydatid cysts in cattle are infertile, and undergo degeneration, symptoms directly attributable to this disease are rare. In cases of heavy infestation, however, the normal action of certain organs, particularly the lungs and liver, may be impaired by reason of the mechanical pressure induced.

Prevention

All measures to control this disease of cattle, sheep, and man should aim at the elimination and prevention of infection among dogs. Dogs should never be fed on raw offal of sheep, cattle, or pigs.

Two classes of dogs—(*a*) slaughter-house dogs ; and (*b*) station dogs—are of primary importance in the transmission of hydatid disease, as they are most commonly fed on raw offal. It should be a routine practice for the owners of all dogs not to feed offal

until it has been boiled for ten minutes; this will render all cysts harmless. Dogs should be rigorously excluded from all abattoirs and slaughter-houses. Infested dogs can be effectively treated to remove the tapeworms.

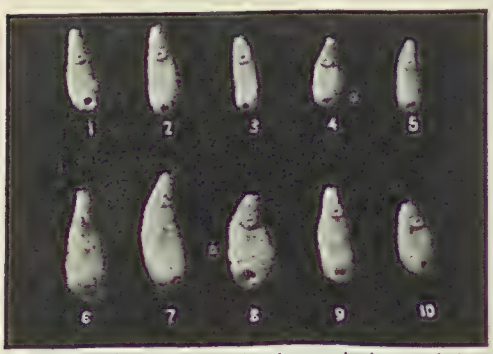
To prevent infection in man the hands should be thoroughly washed after handling dogs, especially before a meal. As a high proportion of cases of hydatid disease are contracted in early life, children should not be allowed to handle station dogs.

THE STOMACH BOT

The stomach bot (*Paramphistomum* spp.), which belongs to the fluke family, is often found in the first and second divisions of the stomach, namely, the rumen (paunch) and the reticulum (tripe) of cattle. It has a small cone-shaped body, pale pink in colour, varying from ¼ to ½ inch in length, and attaches itself to the stomach walls by the pointed end. In this position the adult parasite does not cause any ill-effects but, if present in large numbers, the immature parasites which are found in the intestines may set up profuse diarrhoea.

COCCIDIOSIS

Coccidiosis, sometimes referred to as "dysentery of cattle", is caused by a minute organism (*Eimeria Zurnii*) which penetrates and destroys the lining of the large intestine, giving rise to a severe and often fatal disease. These organisms, or coccidia, are passed out in the faeces from infected calves, and the disease is transmitted to healthy animals by grazing on infested pastures, or drinking contaminated water. Young cattle up to two years are the principal sufferers.



Showing the variation in size and shape of the stomach bot.

Symptoms

The disease is more prevalent during the warmer part of the year, especially in wet years, and in changeable weather, and the first symptom noticed is a sudden attack of diarrhoea with the faeces blood-stained, or containing clots of blood and mucus, and having a very offensive smell. The period of incubation—that is, the time between infection of the animal and the first appearance of symptoms—averages about 21 days, although, in some cases, it is much less.

Mild cases, especially in older cattle, recover rapidly but, with young beasts, the symptoms may become increasingly severe; emaciation becomes marked, and the gait staggering. The eyes become sunken, the animal goes down, and death takes place from exhaustion.

Treatment

Mepacrine hydrochloride is a water-soluble powder and is specific against coccidia in cattle. It is administered at the rate of 1 gramme per 200 lb. body-weight, and is available either in powder or tablet form. The prescribed dose is dissolved in 2 pints of water and is given once daily until the animal responds.

In the event of this drug being unavailable, recovery may be assisted by the judicious administration of astringents such as tannoform and bismuth, and intestinal disinfectants such as thymol and creolin.

For treatment to be beneficial, pasturing should be stopped, dry feeding substituted, and pure drinking water supplied. If very young calves are affected, they should be kept exclusively on a diet of fresh warm milk. This often ensures a rapid improvement in condition. If affected animals are kept in a shed, the floor should be cleaned and disinfected daily, and the soiled bedding should be burned. Hot caustic soda solution is the best disinfectant for floors.

It should be remembered that ordinary cooking methods effectively destroy this parasite.

EXTERNAL PARASITES

In Victoria there are not many external parasites that infest cattle, the principal being ringworm and lice.

Ringworm

Ringworm is a very common complaint in cattle, and principally affects young calves, but may occasionally spread to older cattle. It is caused by a parsitic fungus (*Trichophyton*) which generally attacks the head, especially round the eyes and lips, but may spread to other parts of the body.

Symptoms

The first symptoms are small, circular, bare patches of skin which may grow together and form large irregular-shaped areas. At first the hair is erect and gradually the skin becomes encrusted with scales. These patches are more marked and rougher on dark skins than on light ones. The crusts and the hair may be rubbed off by the animal scratching or rubbing the skin due to the accompanying irritation. This may cause bleeding and excessive thickening of the skin.

Treatment

When treatment is being carried out, it is essential that the curative agent be applied well beyond the margin of the bare patches, so that the infection will not extend further. One of the following remedies may be used, and a cure may be considered complete as soon as the denuded patches become covered with a growth of young hair :—

Sulphurated potash.

Tincture of iodine.

Stockholm tar, 1 part; olive oil, 2 parts.

Soft soap applied as an ointment.

Any of the above should be applied once or twice daily.

Potassae sulphurata (sulphurated potash) may be used as a mixture—2 oz. to 1 gallon of water. It should be rubbed well into affected parts with an old nail brush.

As ringworm is very contagious, care should be taken in handling and treating the affected animals, which should be isolated and their surroundings, such as calf pens and rugs, thoroughly disinfected.

If man or other animals contract this disease, the same treatment as for cattle should effect a rapid cure.

LICE

Cattle lice, of which there are three distinct species, are the commonest external parasites affecting these animals. One of these is the biting louse (*Bivicola bovis*), and the other two are the short-nosed sucking louse (*Haematopinus eurysternus*), and the long-nosed sucking louse (*Linognathus vituli*). All these lice lay eggs which become attached to the hairs of the host.

The Biting Louse

The biting louse is a small, yellowish louse with a blunt broad head, and is usually found along the withers and rump, and sometimes along the back. It causes intense irritation, leading to constant rubbing until the skin becomes raw and bleeding. The eggs of this louse hatch out in about ten days.

The Sucking Louse

The short-nosed louse is greyish in colour on the body, and brown at the anterior end. The head is short and blunt, being about as broad as it is long. The eggs hatch out, and become mature in from 23 to 30 days. This species usually attacks adult cattle.

The long-nosed louse has a head twice as long as it is broad, and is a smaller and more slender parasite. The body is dark-grey, and the head and front portion of

The biting louse (*Bivicola bovis*).

the body are nearly black. The eggs of this species hatch out, and the lice mature within 21 to 25 days. Young cattle are generally infested by this variety.

The short-nosed sucking louse (*Haematopinus eurysternus*).

Both varieties feed by piercing the skin and sucking the blood, and as this process causes great irritation, it leads to interference with animals grazing and, consequently, lowers the vitality and leads to loss of condition and general unthriftiness.

Treatment

Treatment consists of the application of one of the following dressings, which should be applied two or three times, at intervals of ten days. This will ensure the destruction of any young lice that have hatched out after the previous dressing.

Kerosene emulsion is made by dissolving 1 lb. of soft soap in 1 gallon of boiling water, and gradually adding 1 pint of kerosene, constantly stirring until the whole is emulsified. This mixture should be gently rubbed well into the hair.

Nicotine sulphate, ¼ oz., mixed with 2 gallons of soapy water is scrubbed in well with a stiff brush, and allowed to dry in the sun.

Sheep dips are not recommended, owing to the danger of arsenical poisoning from the animal licking itself.

The use of the new insecticides, DDT and Gammexane, for external parasites is now general and these are probably more effective than the mixtures given above, are less toxic, and easier to handle.

The use of 0·5 per cent. water dispersible DDT is recommended, while Gammexane is used as a 4 per cent. powder for dusting into the coat. Both these preparations are supplied by most chemists made up ready for use.

As lice may survive for two or three days away from an animal, it is obvious that, where stock are housed, all rugs, brushes and other equipment, should be disinfected, bedding destroyed by burning, and walls and posts sprayed with a disinfectant solution.

The long-nosed sucking louse (*Linognathus vituli*).

Garden Notes for September

By GEORGE HYAM, Horticultural Supervisor

THE FLOWER GARDEN

THE FLOWERING EUCALYPTS

ALTHOUGH the three hundred odd species of eucalypts all produce flowers, most species either produce these very sparsely and sometimes at irregular intervals or their flowers are relatively insignificant and not very showy, but there are some which give brilliant-coloured blossoms in great profusion each season. It is these which are referred to by horticulturists as "flowering gums."

Strangely enough, most of them are native to arid or semi-arid areas and most produce their flowers in the driest parts of the year, and in all respects they have the capacity to withstand dry conditions better than any other flowering tree. On the other hand, they are tolerant to any garden conditions in Victoria except perhaps in the cooler high rainfall highland districts and they will respond to some irrigation during dry periods, but certainly not in soil which is always wet or where drainage is poor. It is this provision of soil moisture during dry seasons which allows some of them—particularly the Scarlet-flowering gum, *E. ficifolia*—to attain a size and profuseness of blossom which is seldom seen in their native arid habitat.

Some of the most showy flowering gums are comparatively dwarf in size, ranging from a height of 8 to 15 feet which makes them very suitable for small gardens, and most of the others which can grow normally to 20 or 30 feet can be kept a good deal lower than that. For large gardens, and for inclusion in farm plantations, a few flowering gums interplanted with other gums grown for shade or for their foliage, provide interest and colour in an otherwise rather dull row or coppice. Specimens of the different species of flowering gums are inclined to be individualistic in habit and thus are not very suitable for formal avenues such as are looked for in suburban streets, but a row of a single species or a plantation of mixed species each side of a drive can look very attractive and there are instances of coppice planting of these, bordering wide roads, which are very pleasing.

The range of flowering gums now obtainable is greater than it was before the war as there are now more nurseries specializing in the raising of Australian plants generally, and the seeds of most of those mentioned hereunder are available.

August and September are about the most favorable months for planting nursery-raised eucalypts of all kinds, especially where little or no water will be available. Seed may also be sown now for planting out the following autumn or spring. In dry areas, it is advisable to dig over and fallow the soil for at least 3–4 feet round each planting site in order to conserve as much of the spring rains as possible, and if this is done, and a good mulch of straw or sawdust placed sufficiently deep to suppress weeds, say 3–4 inches round each newly-planted tree, they will probably survive without any applied water. However, it is safer to give each young tree a soaking with about a kerosene-tinful of water each month during the dry period of the first year. Light waterings, even if frequent, can do more harm than good if the surrounding soil is quite dry.

Under garden conditions, flowering gums need not be specially watered, as they will draw all the moisture they need from moisture normally applied in the course of other garden operations, but on no account allow the soil around them to be perpetually sodden. A light stake to each plant is advisable to preserve an upright habit in their early stages. Any shoots appearing where they are not wanted should be rubbed off before they develop to keep the plants reasonably symmetrical. Apart from these points, the only further attention they need is to spray them if they are attacked by any of the several possible gum leaf-eating insects, using D.D.T. for these if such appear. To guard against gum scales, white oil should be applied. As the trees approach maturity, insects which normally attack native gum trees do little permanent harm and as in nature, do a certain amount of what might be termed, natural pruning, but they can

seriously damage young trees if allowed to build up. Later there is another point which is not so generally known and this is that the following season's flowering will be better if the seed capsules which follow the flowering are promptly cut off before they mature.

Species of Flowering Gums

The best known and one of the most beautiful is the Scarlet-flowering gum, *E. ficifolia*. It has one disadvantage in that at present, and in common with all other gums, no means of vegetative propagation has been found and consequently, a colour variety or strain cannot be perpetuated in this way. All are from seed and in this case, the colour range of seedlings even when raised from seed from the same capsule is variable, ranging from a rather dirty pink to reds, orange and to the brilliant scarlet which everybody hopes for, although every colour but the first is attractive. Most other flowering gums come true to colour from seed. One point that is worth noting is that usually the nursery plants of *ficifolia* that are slowest in growth and may appear rather stunted in the pots are usually those which produce the deepest colours provided that the stunting is not due to bad handling at the nursery. This species can attain the height of 30 feet, but for garden purposes the height can be restricted to 10 feet without seriously affecting the flowering. *E. ficifolia* takes about 7 years to produce its mature masses of blossom which occur from January to March.

E. calophylla rosea, the Pink-flowering gum, can generally be relied upon to come true to seed but there is a white variety, alba. If raised side by side, the white variety will be the faster grower in the early stages. *Calophylla* is a symmetrical tree growing to 30 feet and both are perhaps more suitable for large rather than small gardens. They make a good breakwind.

E. caesia produces more handsome rose-pink flowers which are set off by golden anthers. It is one of the dwarf varieties, growing only from 8–10 feet and is in every way suitable for small gardens. Its colours are always the same.

E. erythrocorys grows to 20 feet with only one colour—red with yellow centres. Its common name Red-cap gum is derived from the fact that its capsules are also a brilliant red which makes it decorative over a long period. It also has an attractive near-white bark.

E. erythronema—the Lindsay gum, is a dwarf species growing 10–15 feet, has brilliant red flowers which are produced earlier than most in late spring. It is one of the hardiest species in dry areas. There are tall varieties (20 feet) but the variety *Lairdii* is dwarf and best for small gardens. *E. forrestiana* (10 feet) is one of the best of yellow-flowering gums and the flowers are followed by reddish fruits. This species is also very tolerant to arid conditions.

E. leucoxylon, the Pink-flowering ironbark (20 feet) is more suitable for large areas and the seedling plants sometimes will revert to the white form.

E. macrocarpa is more of a shrub than a tree as it has a shrubby tendency and only reaches the height of 6–8 feet. It has large silvery-white leaves and large crimson flowers which are larger than those of any other species.

E. pyriformis—the Pear Gum, so called from its pear-shaped fruits, is also shrubby in habit and bears large crimson flowers and grows to a height of 6–8 feet. Quite a good garden gum.

E. Steedmanii is a yellow-flowering kind which unlike most other flowering species is regular in habit and so is often used for low breakwinds. It grows to 15 feet.

E. Stricklandii is another yellow-flowering kind with ornamental flowers, growing to 15 feet.

E. tetraptera which grows from 8–10 feet is one of the best of the red-flowering gums for garden purposes and is another which has colourful fruits.

E. torquatta, the Coolgardie Gum is, in the writer's opinion, the best of all for garden purposes. It grows to 8 feet with an attractive pendulous habit, bearing rich orange-scarlet flowers in profusion. Its buds are almost as attractive as the flowers and are of the same bright shade, and this species also has the advantage of starting to flower when quite young.

This list is by no means complete but is confined to those species which are the more readily available from nurseries or whose seed is usually stocked by seedsmen who handle tree seeds.

THE VEGETABLE GARDEN

Perennial Vegetables from Seed

Gardeners in country districts often have difficulty in obtaining those vegetables normally planted as root-divisions such as asparagus, rhubarb and the various herbs. Apart from the possible delay of a season before they come into profit (herbs will produce during their first season) they can be easily raised from seed and the cost is much less. Even for those handy to a source of supply of plants there is much to be said for this practice, as seedlings can be rigorously culled out before planting permanently and with the greater assurance that there will be no transmission of disease.

August and September is a good period for sowing these seeds. Asparagus is sown in drills about 1 inch deep in a soil made friable with compost. In heavy soils it is best to prepare a row in a similar manner suggested for carrots in last month's notes. A caked soil may so distort the plants that it makes it difficult to select the best types for planting out permanently. Sow as thinly as possible or if only a short row is needed, the seeds are large enough to place individually about 2 inches apart, otherwise they should be thinned out to that distance when the plants are about 12 inches high. Some thin the plants to 10–12 inches apart so as to allow extra root development in order that they can be planted out the following winter, but the better way is to lift the seedlings without further thinning next May or June and replant in a nursery bed for another season's growth before planting out permanently. This allows for a more judicious culling.

The best varieties for our conditions are Mary Washington, Paradise or Connover's Colossal, the seeds of which are obtainable from leading seed merchants.

Rhubarb seed is sown in a similar way but in this case plants are thinned out to a spacing of 12 inches when a few inches high. If necessary the thinnings will transplant. An alternative is to sow three seeds in each site on a permanent bed giving the normal spacing of 30 inches between groups. As seedlings vary and do not come quite true to the parent, if sown in nursery drills and spaced as above, the stems they produce can be sampled and cooked and so culled by flavour and texture which is a more important factor than size at this early stage, as eventual size and yield is due more to proper feeding in the permanent beds than to strain, and for the table the largest stems are not necessarily the choicest. The two main strains of seed obtainable from local seedsmen are Sydney Crimson, which produces early winter stems as well as some lighter spring pickings, and Victoria Giant, a spring and summer-producing type. It was from seedlings produced from these two strains that the existing named varieties, which are normally planted from divided crowns, were originally selected.

Small quantities of any of the herbs sufficient for home use can best be sown in drills where some plants are to remain, progressively thinning out the young plants until the right spacing for the variety is left between the plants. For large areas, the seedlings should be pricked out into boxes when about 1 inch high and grown on until the following autumn planting season, nipping back the top-growth from time to time to encourage a bushy root system before planting out in the field.

Start Thinning out Root Crops at an Early Stage

Allowing the plants of root crops to remain overcrowded checks the normal rate of growth by interfering with the proper development of the root itself. Thinning should be gradual, starting when the plants are about 2 inches high, first thinning out to about 1 inch apart. This particularly applies to red beet, the "seed" of which is really a seed case which often contains two or three seeds. The development of turnip-rooted beet is faster than that of carrots and parsnips.

The second, and if necessary, the final thinning to about 3 to 4 inches can be made when in the four-leaved stage or when the leaves are about 6 inches high. Whenever thinning is to be done, the soil should be moist and watered the night before if dry, and after thinning, water should be applied again to settle the soil round the plants remaining. This also applies if weeding has to be done between the plants in the rows at any stage.

Onions which have been sown direct in the beds should likewise be thinned at

the same early stage to at least 1 inch apart. The subsequent thinnings to 5 inches apart can be progressive in order to use the thinnings for salads, but thinning should be completed before the bulbing starts as at that stage, possible root disturbance of the plants left to mature can affect the size of the bulbs.

Peas are often sown too thickly and better yields will be got from peas which have room to stool out to four or more stems. Any thinning of peas is best done when about 4 inches high or less and for garden grown peas, the spacing should not be less than 3–4 inches between plants in the row.

Orchard Jobs for August

Apply fertilizers to fruit trees just before spring ploughing.

Apply Bordeaux spray, strength 15 : 15 : 100 to peach trees at "bud swell" for the control of leaf curl and brown rot. If winter sprays have not been used, combine D.D.T. in oil with Bordeaux for aphis control.

Apply Bordeaux spray, strength 15 : 15 : 100 to apricots for shot hole, freckle, brown rot, and blossom blight.

For citrus trees in Murray Valley Irrigation districts, apply 10 lb. zinc sulphate, 5 lb. slaked lime in 100 gallons of water for zinc deficiency.

Apply Bordeaux 6 : 6 : 100 plus ½ gallon white oil, to citrus trees for control of Septoria spot, anthracnose and citrus pit.

Is a simple arrangement that multiplies the power at the handle 260 times—handy to use, easy to move, quickly rigged, and works in roughest country. Standard equipment pulls trees and stumps from 1½ acres without changing anchor. Many other time- and labour-saving features. Catalogue with pleasure.

TREWHELLA BROS. PTY. LTD., TRENTHAM

CERTIFIED PULLORUM-TESTED POULTRY FLOCKS

A certified Pullorum-tested Flock is one in which all stock over six months of age have given a negative reaction to the agglutination test for Pullorum Disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector, but it is not necessarily a guarantee of the type of birds in the flock.

The under-mentioned flocks have been certified by the Department of Agriculture, and will remain so for the current calendar year, or until such time as the Chief Veterinary Inspector determines.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Particulars of breeds of birds tested are as shown hereunder:—

A. Australorp; B. White Leghorn; C. Rhode Island Red; D. Sussex; E. Langshan; F. Brown Leghorn; G. Buff Orphington; H. Black Leghorn; I. Minorca; K. Legbar; L. Turkeys; M. New Hampshire; N. Plymouth Rock; O. Indian Game; P. Ancona; Q. Blue Leghorn.

Owner.	Breed.	Number of Birds.
Adlington, G. A., Maldon-road, Castlemaine	A, B	1,312
Anderson, G., Torbay-street, Macleod	A, B	1,387
Barnes, A., "The Heights," Blackburn	A, B, C	2,400
Barnett, W. H., 17 Brougham-street, Box Hill	A, B	549
Bassett, R., South Muckleford ..	B	135
Bayfield, A. E., Westall-road, Springvale	A, B, C	1,058
Bayfield Poultry Farm (J. E. Robinson), Bayfield-road, Bayswater	A	752
Booth, S. J., Benalla-road, Shepparton	A, B	595
Boyce, A. D., Springvale-road, Forest Hill	A, B	1,455
Bray, J., 18 Hotham-street, Warrnambool	B	123
Casson, D., 20 Avoca-crescent, Pascoe Vale, W.8	A, B, C	1,299
Cook and McKnight, Lyons-road, North Croydon	A	2,326
Corbett Bros., Torbay-street, Macleod	A	2,647
Crawcour and Edmonds, Clarinda Poultry Farm, Centre-road, Clarinda	A, B, C	2,401
Crawcour and Edmonds, Ashgrove Poultry Farm, Mountain-road, Cockatoo	A, B	1,643
Cumming, H. D., Darlington ..	A, B	113
Davey, A. R., Sellars-street, Greensborough	A, B	1,445
Davidson and O'Keefe's Hatchery (Mrs. G. Hocking), 22 Sherbrooke-avenue, Ringwood	A, B, C	664
Davies, L. F., Ireland-road, Spring Vale	B, C	2,581
Davies, R. G., 24 Sherbrooke-avenue, Ringwood	A, B	906
Day, L., Kyvalley	A, B, C	2,252
Ellen, J., Rossmoyne Pig and Poultry Farm, Avoca	A, B	4,558
Ellis, G., Merrigum	A, B	2,616
Etherington, R. R., Karadock-avenue, Irymple	A, B	2,396
Firkins, H., Frankston-road, Cranbourne	A, B	2,645
Ford, J. V., 11 Barker-avenue, Shepparton	A, B, C,	990
Frost, M. C. (Mrs.). "Araluen," Barwon Heads	A, B, C	1,003
Fryc, I. H., Grimshaw-street, Watsonia	A	1,123
Fullerton, G. H., Long Gully, Bendigo	A, B	967
Gibbs, J., Highway Stud, Lower Plenty	A, B	914
Grenville, G. W., Grenville Stud Poultry Farm, Springvale-road, Springvale	A, B, C	3,051
Grice, J., North-road, Langwarrin ..	A, B	998
Gwyther, R., Valley-road, Highton, via Geelong	A, B	1,265
Haigh-Lumby, J., Cranbourne-road, Frankston	A, B	622
Hanson, S. H., Box 7, Kilmore ..	A	43
Hayes Bros., Mt. Dandenong-road, Montrose	A, B	1,893
Hoffman, C. W., 5 Pearl-street, Horsham	A, B	2,985
Holder, G. E. and W., "Seven Acres," Ferntree Gully	A	308
Hurst, B. H. G., New-street, Eltham	B	1,816
Jenkin, H. A., Torquay-road, Belmont	B	665
Johnson, M. (Mrs.), Ivanhoe Poultry Farm, Ferntree Gully	A, B, C	2,147
Kenneally, W. R., Hampton Park ..	A, B	1,110
Kennedy, F., cr. Watson and Ferntree Gully-roads, Glen Waverley	C	759
Kerr, J. J., Clarke-road, Springvale ..	A, B	3,126
Kostos Bros., Waverley-road, Oakleigh	A, B, C	2,904
Kroker, W. E., Horsham	B, C	742
Lambert, D. L. (Mrs.), Donald-road, Wheeler's Hill	B, C	92
Le Lievre, R., Katandra	A	734
Lucas, George, Liverpool-road, Kilsyth	A, B	352
McCabe, R., Gladstone-road, Dandenong	A, B	1,626
McCann, Ian R., Crowlands-road, Stawell	A, B	1,660
McCann, R., and Son, "Moray," Crowlands-road, Stawell	A, B	4,392
McGahy, Mary E. (Mrs.), Manningham-road, Doncaster	A, B N, O	606
McKay, D., Landell's-road, Pascoe Vale	B, C	4,329
McLaren, A. D., Alexander-street, Mooroopna	A, B, C	1,248
McLister, K. C., 173 Hall-street, Spotswood	A, B, C	6,930
McLauchlan, D. F., Rossiter-road, Koo-wee-rup	A, B	1,392
McMahon, G. J., Burwood-road, Vermont	A, B, C	1,217
McQueen, R. J., Spring-road, Highett	C	517
Major, C. D., 59 Simpson's-road, Eaglehawk	A, B	3,232
Mason, David B., Montalbo-road, Ringwood	A, B	1,275

CERTIFIED PULLORUM-TESTED POULTRY FLOCKS—*continued.*

Owner.	Breed.	Number of Birds.
Maytime Stud and Hatchery (R. J. O'Brien), Watson's-road, Glen Waverley	C, D	525
Mills, J. J., Kilvinside-road, Noble Park	A, B, C	1,378
Milner, R. J., 59 Austin-crescent, Pascoe Vale, W.8	A, B, E, P, Q	2,585
Modra, L. H., 43 McCulloch-street, Nunawading	A, B	859
Morris, C. H., St. Clem's-road, Doncaster	A, B	524
Mudford, C. A., 15 Kirkwood-street, Eaglehawk, via Bendigo	A	1,005
Mumford, L. J., Healesville ..	A	347
Musgrove, J. M., 16 Wellington-avenue, Blackburn	B	1,261
Myer, Emporium ("Norman Lodge," Mt. Eliza)	A, B	2,320
Neale, S., Edward-street, Boronia ..	A, B	1,038
Nemet, P., Springvale-road, Springvale	A, B, C	3,456
Paton, W., Glenburnie-road, Mitcham	B, K	606
Pitman, I. (Mrs.), Kangaroo Ground	D	52
Poulton, Alan W., Vickers-street, Sebastopol	A, B, C	2,156
Rae, John, 277 Albert-street, Sebastopol	A, B	1,835
Reid, R. C., 114 Graham-street, Castlemaine	A, B	938
Ridge and Son, Myrtle-grove, Blackburn	B, C, D	3,527
Ruskin Poultry Farm and Hatchery (A. McVay), Kernot-street, Spotswood, W.14	A, B	3,411
Ryan Bros., Junction-road, Blackburn	A, B	862
Sadler, S., 99 Baynes-street, Terang ..	A, B	810
Salmond, J. B., Deer Park ..	H, Q	100
Scales, J., and Son, West Wattle Tree-road, Boronia	A	2,263
Schulze, L. H., Torquay-road, Grovedale	A, B	1,749
Simpson, G. D., "Greenways," Mayroad, Glen Waverley	A, B	3,562
Smith, F., Lenham Stud Poultry Farm, Terang	A, B	2,123
Snodgrass, R., Pakenham East ..	A, B	1,366
State Research Farm, Werribee ..	A, B, K	1,200
Stephens, R., Reservoir-road, Kennington	A	1,835
Stewart, H. D., Marshall-street, Maryborough	C, K	417
Stewart, J. A., Maldon-road, Castlemaine	A, B	295
Stoneman, J. W., Campbell-road, Briar Hill	C, F	216
Streeter, H. A., Avoca	B	524
Swift, D. A., Kangaroo Flat ..	A, B	2,045
Taylor, H. L., 180 Surrey-road, Blackburn	A, B, M	288
Taylor, H. R., 119 Rathgown-street, Reservoir	A, B, C	1,941
Taylor, R. H., 132 Rathgown-street, Reservoir	A, B, C	3,874
Thomas, W. A., Springvale-road, Springvale South	A, B, C	1,093
Thomson, G., "Fortuna," Westall-road, Springvale	A, B	1,186
Trevallyn Poultry Farm (Tubb, F. H.), Sydney-road, Campbellfield	B, C	3,101
Waiting, T., Scoresby-road, Bayswater	A, B	1,735
Waugh, A. J., Kangaroo Flat ..	A, B	856
Wohlers, S., Dooen-road, Horsham ..	A, C	385
Wright, A., Wunghnu	A	700

TUBERCLE-FREE DAIRY HERDS

ACCREDITED TUBERCLE-FREE HERDS

The following dairy herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual, physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive, physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Breeds of Cattle comprising the below-mentioned herds are as follows:—

A.A., Aberdeen Angus; A.I.S., Australian Illawarra Shorthorn; Ayr., Ayrshire; D.Sh., Dairy Shorthorn; F., Friesians; G., Guernsey; J., Jersey; P.H., Poll Herefords; R.P., Red Poll; Sh., Shorthorn.

Name.	Address.	Breed.	Number in Herd.
Aboriginal Station ..	Lake Tyers ..	J.	152
Alberni Bros. ..	Ferntree Gully ..	Sh.	80
Ampt, E. W. ..	Gymbowen ..	Ayr.	6
Anderson, G. R., & Son	Toolern Vale ..	J.	57
Andrew, J. H. ..	Whittlesea ..	Ayr.	35
Assumption College ..	Kilmore	F.	34
Atkinson Bros. ..	Swan Hill ..	D.Sh.	160
Attorby, H. A., & Son	Hamilton ..	J.	22
Ballarat Mental Hospital	Ballarat	Ayr.	117
Ballarat Orphanage	Ballarat	J.	105
Beattie, W. P. ..	Katandra West ..	J.	57
Beer, W. G., and Sons	Nanneella ..	R.P.	108
Beggs, A. R. ..	Beaufort ..	R.P.	61
Bleakey Bros. ..	Horsham.. ..	D.Sh.	20
Boardman, Mrs. E. G.	Alvie	J.	81
Bott, J.	Yarrawonga ..	A.A.	134
Bradbury, H. A. ..	Mooroopna ..	G.	42
Bruhn, C. H., and V. I.	Mirboo North ..	J.	68
Buchanan, J. M. ..	Flinders	Ayr.	69
Bunn, A. A. ..	Tatura	Ayr.	115
Burgman, F. A. ..	Katandra West ..	J.	108
Burley, H. ..	Mortlake ..	J.	50
Callahan, Philip ..	Barwon Downs ..	D.Sh.	66
Calvert, N. M. ..	Neerin Neerin ..	G.	23
Carne, W. J. ..	Pakenham Upper	J.	42
Carson, M. E. ..	Irrewillipe East ..	J.	116
Carson, J. M. ..	Lima South ..	J.	73
Charles, R. C., and Sons	Glenburn ..	H.	91
Charlton, G. F. ..	Stoney Creek ..	J.	55
Chirnside, R. G. ..	Skipton	J.	74
Christy, W. A. ..	"Burwill," Echuca Village	J.	46
Clark, P. W., and Son	Whittlesea ..	J.	87
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Cox, F. G. ..	South Lyndhurst ..	J.	55
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Cribbs, T. A. ..	Wangaratta ..	J.	50
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Davies, M., and L. ..	"Fine View," Dimboola	Sh.	20
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Dougall, J. K. ..	Hastings ..	J.	48
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Dunster, H. R. ..	Moyston	G.	30
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Everist, F. ..	Tyabb	A.A., R.P.	32
Ewence Bros. ..	Warrnamboo ..	F.	121
Fidler, F. W. ..	Werribee ..	F.J.	45
Finch, F. M. ..	Beaufort ..	D.sh.	12
Fixter, A.	Boisdale	G.	20
Foletta, G. G., and Son	Buxton	Ayr.	188
Fyfe, Mrs. P. S. ..	Berwick	G.	5
Gilbert, J.A., and R. D.	Yinnar South ..	J.	110
Gleeson, P. J., and Son	Tynong	J.	158
Goddard, James H., and Sons	Cora Lynn ..	Ayr.	107
Gorman, A. W. ..	"Cathcart," Alexandra	Ayr.	94
Graves, L. J., and A. L.	Battery Park, Mansfield	A.A.	125
Griffiths, J. G. ..	Benalla	D.Sh.	114
Gross, Mrs. G. F. ..	Green Lake, via Horsham	J.	24
Hamilton, A. ..	Flinders	Ayr.	79
Harrison, B. ..	Hamilton ..	F.	45
Hartwick, J. P. ..	Hamilton ..	Ayr.	42
Haywood, Dr. A. R.	Hastings ..	J.	21
Hearn, Miss I. K. ..	Rochester ..	G.	92
Hicks, E. J., and Sons	Echuca	J.	106
Howell, G. G. ..	Wollert	P.H.	94
Howlett, E. and G.	Lang Lang ..	J.	117
Ivone, M., and Sons	Ovens	J.	143
Jackson, H. ..	Lockington ..	J.	45
Johnson, F. T. ..	Horsham.. ..	J.	36
Jones, A. C. ..	Barnawartha ..	A.I.S.	154
Jowett, Capt. A. C...	Clonbinane ..	R.P.	69
Keele, H. A. ..	Bamawm ..	J.	63
Kelynack, P. T. ..	Bundoora ..	J.	88
Kemelfield, J. ..	"Wongala," Woodend	Sh.	88
Kemp, E. J. ..	Horsham.. ..	Sh.	8
Kerr Bros. ..	Bacchus Marsh ..	Sh.	33
Kilpatrick, B. A. ..	Mernda	J.	66
Klemm, H. F. ..	Londrigan ..	J.	84
La Fontaine, G. ..	Mitta Mitta ..	J.	63
Light, D. T. ..	Noradjuha ..	J.	6
Longerenong Agricultural College	Dooen	Ayr., P.H.	120
Lorimer, C. O. ..	Ocean Grove ..	R.P.	56
Ludeman, L. C. ..	Ayrford, via Timboon	J.	120
Luke, K. G. ..	Romsey	P.H.	79
Maloney, P. J. ..	Tongala	J.	77
Maybery, A. H. ..	Mitre	D.Sh.	11
McCombe Bros. ..	Horsham.. ..	D.Sh.	133
Meaklim Bros. ..	Mooroopna North	D.Sh.	59
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Middleton, J. A. ..	Labertouche ..	F.	67
Millman, A. J., and Son	Colac	F.	111
Morris, J., and E. ..	Barramunga ..	J.	70
Murphy, J. J. ..	"Glen Vale," Lang Lang	Ayr.	47
Myers, J.	Myrniong ..	D.Sh.	88
McCallum, W. J., and Sons	Tatura	J.	84
McCormack, M., and Sons	Mansfield ..	R.P.	127
McIlroy, B. ..	Edi	J.	138
McIntosh, J. ..	Merrigum ..	R.P.	85
McKenzie, E. ..	Wandella, via Kerang	J.	75
McKenzie, Mrs. E. J.	Woodford ..	J.	65
Mackenzie, H. P. ..	Trawalla ..	J.	33
McMillan, W. ..	North Mooroopna	G.	62
McNabb, G. A., and Son	Irrewillipe East ..	J.	118
McPherson, A. L., and J.J.	Kyneton ..	D.Sh.	98
Nancarrow, E. J. ..	Kerang	J.	28
Nankervis, A. ..	"Wattle Grove" Wooragee	J.	143
Newton, J. M., and Sons	Whoroully ..	A.I.S.	101
Newton, J., and W.	Tarrawingie ..	J.	81
Nicholas, M. A. ..	Sherbrooke ..	J.	77
Nicholson, Mrs. L. E.	Banyule Stud, Yarra Glen	J.	92

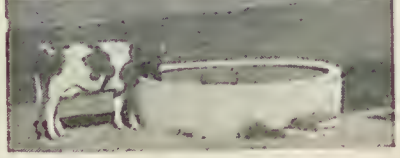
TUBERCLE-FREE DAIRY HERDS—*continued*

Name.	Address.	Breed.	Number in Herd.
Noonan, Mrs. S. A.	Benalla	J.	50
Norris, G. H. ..	Dixon's Creek ..	J., G.	76
Northcote Children's Farm	Bacchus Marsh ..	J., Sh.	89
Payne, A. E. T. ..	Lilydale	G.	89
Payne, T. E. N. ..	"Woolburn," Kilmore	R.P.	77
Pelchen, E., and F...	Moutajup ..	Ayr.	16
Perry, W. C., and L.	Buxton	Ayr.	52
Prosser, J. E. ..	Ondit	J.	42
Ralph, J.	Binnum	D.Sh.	142
Read, I. D., executors of estate	Springhurst ..	J.	94
Richardson, W. S. ..	Bayswater ..	J.	13
Ritchie, R. B., and Son Pty. Ltd.	Penshurst ..	J.	118
Rix, A. A. ..	Officer	J.	66
Robinson, T. W. ..	"The Ranch," Warracknabeal	J.	34
Rutherglen Research Station	Rutherglen ..	J.F.	71
School of Horticulture	Burnley	J.	2
Scott, A. L. ..	"Wolonga," Kongwak	J.	55
Selwyn-Scott, F. E.	Scotsburn ..	D.Sh.	77
Sewell, Estate of Sir Sydney	Berwick	G.	72
Shanahan, G. ..	Myrniong ..	D.Sh.	126
Smith, L. J. ..	Lower Norton ..	R.P., J.	4
Speirs, A. E., and Sons	Nalangil	Ayr.	62
State Research Farm	Werribee ..	R.P., F.	231
Stephens, Dr. F. ..	Vermont ..	G.	32
Stokes, R. N. ..	Millgrove ..	D.Sh.	70
Strachan, R. A. ..	Coleraine-road Farm, Hamilton	F.	244
Taylor, J. M. ..	Mooroopna ..	Sh.	36
Thompson, H. D. L.	Merricks	J.	50
Till, J. A.	Tongala	J.	30
Tucker, E. G. ..	Horsham.. ..	D.Sh.	36
Uebergang, E. A. ..	"Sunnyhurst," Natimuk	D.Sh.	16
Walker, C., and Son	Macedon ..	J.	45
Ware, J. G., and Sons	Lower Gellibrand	G.	32
Warnock, J. A. ..	Lima South ..	J.	142
Waterhouse, J. H. ..	Pakenham ..	J.	82
Waters, G. L. ..	Echuca	J.	94
Watson, R. G. ..	Frankston ..	G.	38
White, F.	Warrenbayne ..	J.	42
White, J. E. B. ..	"Challicum," Buangor	J.	18
William's Victoree Farms	Dalmore	A.A.	54
Williamson Bros. ..	Carisbrook ..	Sh.	162
Wilson, Alan ..	Tongala	J.	47
Wilson, J. C. ..	Gnotuk	A.A.	103
Wilson, J. L. ..	Koo-wee-rup ..	A.I.S.	105
Woodyer, P. A. ..	Bittern	J.	22
Woori Park Pty. Ltd.	Pakenham ..	G.	101
Young, N.	Whittlesea ..	J.	86

In addition to the above, the following is a list of herds in their respective districts which have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the Accreditation Scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

District.	Herds.	Cattle.
Ararat	8	327
Bairnsdale	7	441
Ballarat	81	2,770
Benalla	7	128
Bendigo	61	2,511
Berwick	43	1,531
Broadmeadows	97	3,791
Buln Buln	1	130
Colac	5	187
Cranbourne	11	469
Creswick	4	95
Dandenong	3	127
Doncaster	18	678
Eltham	7	374
Geelong	103	4,343
Hamilton	11	496
Heidelberg	39	936
Heytesbury	3	137
Horsham	9	356
Kerang	3	101
Mornington Peninsula	130	3,513
Morwell	4	505
Portland	18	680
Rutherglen	16	413
Sale	10	674
Shepparton..	8	677
Stawell	4	130
Swan Hill	5	259
Terang	2	73
Wangaratta	5	305
Warragul	60	3,189
Warrnambool	11	328
Whittlesea	193	7,252
Wonthaggi	12	732
Woorayl Shire	24	1,573
Yarragon	31	1,636
Yea	34	72

There are also 1,635 herds, in which 69,132 head of cattle have passed one test and may be considered, therefore, to be in process of becoming tubercle-free herds.



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Picture on Front Cover—

Haymaking operations in progress at Timmering (between Rochester and Kyabram) on the property of Mr. L. F. Ball. This crop of hay, self-sown on wheat stubble, yielded 30 cwt. per acre.

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SILAGE MAKING ON DAIRY FARMS

By K. G. LEWIS, Assistant Dairy Husbandry Officer

The practice of making silage from surplus pasture growth on Victorian dairy-farms is not new. It was popular many years ago but its popularity decreased as farm labour became more expensive and scarce. However, with the recent invention of implements which take much of the manual work out of silage-making, new interest has developed in this method of conserving fodder. In this article the author answers many of the questions in the minds of those who are making silage for the first time.

MOST of the advantages of making silage arise from the fact that silage-making is fairly independent of weather conditions and can therefore commence earlier in the season than hay-making. The advantages of making silage include the following :—

1. Good Control of Pasture

A large proportion of the farm can be shut up for silage because paddocks cut early in the season have a good regrowth which can be grazed early in the summer when good quality grass is at a premium. The herd, therefore, has a comparatively small area to control when pastures are making their spring growth. On most dairy-farms, pastures are inadequately controlled during the spring, and this has three adverse effects.

(*a*) There is much waste in grass that is allowed to become rank because stalky grass is unpalatable and low in food value.

(*b*) The actual area grazed by the herd in the summer is reduced because a large part of the farm is taken up by the rank dry grass while the cows continue to eat the patches of short palatable feed.

(*c*) Undesirable grasses such as Yorkshire fog and sweet vernal are favoured by lax grazing, while white clover, a low growing

plant, tends to be crowded out of the pasture. The composition of the pasture thus changes, comparatively unproductive species become dominant and the pasture becomes a poor one.

When a paddock is cut early, the cover is removed from the pasture at about the same time as white clover is making its most vigorous growth. Also, the undesirable grasses and weeds are prevented from seeding.

2. Heavy Pasture Yield

It has been proved that when a paddock is cut early the total yield of the pasture for the season is greater, although the weight of the crop taken off is probably smaller, than the annual yield when a late hay crop is cut. The reason for the greater total yield is that a much better regrowth follows an early cut than a late cut, especially where the summer is dry.

3. Good Quality Foodstuff

Silage can be made early in the season when the crop is still in the leafy nutritious stage, whereas in many districts weather does not permit haymaking until most of the grasses are in the seed-head stage. The losses of nutrients involved in the silage-making process may be about the same as the losses involved in haymaking, but in silage-making the initial material is likely to be of much better quality, and therefore the final product will be of better quality also. Farmers have proved that cows will milk well during the summer and winter months on a diet consisting largely of silage.

Briefly, these advantages result in cows on farms with a silage-making programme being well fed for a longer period of the year than if hay is harvested and is the only supplement fed. The silage aftermath provides good leafy pasture in the summer and, at times when pasture growth rate is slow, the pasture can be supplemented by feeding silage which has a high protein content and is capable of supporting milk production as well as providing a maintenance ration. This results in a long average lactation period which is one of the most important features of high producing herds in this State.

VALUE OF SILAGE FOR DAIRY COWS

Except in irrigation areas, Victorian dairy cows cannot maintain high production during the summer months on pasture alone. For this reason supplements of various types are fed. These include forage crops such as maize, turnips, chou mollier, and millet; concentrates such as crushed oats, bran or proprietary meals; lucerne, and to a lesser but increasing extent, silage.

In the main dairying areas of New Zealand, farmers are faced with the same problem in the dry summer months. In order to determine the relative merits of two commonly used supplements, green lucerne and silage, a feeding trial was carried out at Ruakura Research Station in 1950 using nine sets of identical twin milking cows. One group of nine cows had its pasture intake supplemented by silage while the other group, consisting of their identical twin mates, was fed lucerne. The trial commenced on January 4th and continued for thirteen weeks. The cows fed silage ate an average of 47 lb. of this feed per day each while the cows in the other group consumed an average of 79 lb. of freshly cut lucerne per day. The production of the two groups at the commencement of the experiment was similar. Both feeds

Feeding out silage in March. Obviously eager for their feed, these cows were maintained in excellent condition through a long, dry autumn.

Mr. D. Dodd, Dumbalk North, mowing pasture or conservation as silage.

tended to check the fall in production but the production fell from an average of 6½ lb. of butterfat to 4½ lb. per cow per week over the thirteen week period. Over the whole period the lucerne-fed cows produced only 2 lb. of butterfat per cow more than the cows fed silage. This result is surprising because lucerne, on the basis of its chemical composition, would appear to be a much better food than silage. The experiment was repeated for an eight-week period in the following dry season, and again, there was no significant difference in the productions of the two groups of cows.

These experiments proved what many farmers both in New Zealand and Victoria have observed on their own farms, namely, that good silage fed to cows as a supplement to dry pasture over the summer months is very effective in checking the rate of fall in production which always occurs over these months.

It should be emphasized that good silage was used in these trials but, as has been pointed out earlier, because silage-making is largely independent of weather conditions, good silage can be made in any but freak seasons in most dairying areas. Unfortunately, because of the rainfall distribution in our better dairying areas, really good hay is obtained only in very favourable seasons.

THE PRESERVING PROCESSES

The quality of silage depends to a certain extent upon the quality of the green material used, but the treatment of the harvested material after collection is equally important.

In order to understand better the effect of factors such as rate of harvesting, rolling, and wilting on the quality of the finished product, it is necessary to know what goes on in a silage stack or pit after the crop has been collected.

For some time after a silage crop is cut the cells in the leaves and stems remain alive and continue to respire or breathe. This process continues even after the material is put into the stack or pit. Oxygen from the air trapped in the green material is taken up by the plant cells and carbon-dioxide is given off when sugars and other substances are burnt to provide energy for the normal cell processes. These reactions, which involve the release of heat energy and consequent heating of the stack or pit, continue for as long as there is free oxygen remaining in the material. The amount of heat liberated, and consequently the temperature which the material reaches, depends on how long this respiration proceeds, which in turn is dependent on the amount of air trapped in the ensiled material. This is an important principle to remember

Section of a wedge-shaped stack of silage. Very little waste occurred in this stack which was "self-sealed" in the spring and opened in March.

because the correct temperature is one of the most important factors determining the success of the ensiling process.

The second phase in the conversion of green material to silage commences a day or two after collection. At this stage, respiration has ceased, the plant cells die and collapse and the liquid contained in them works its way through the stack or pit and some drains away from the bottom. Conditions at this stage are very suitable for the multiplication of bacteria which were present on the leaves and stems of the harvested plants. There are two main types of bacteria—the lacto bacilli which produce lactic acid and the clostridia which produce butyric acid. The quality of the silage is dependent on which of these bacteria multiplies the faster.

If the temperature of the material is low and little air is present, conditions are more suitable for the clostridia and an undesirable fermentation takes place which produces an unpalatable type of silage. If, on the other hand, the temperature is such that the material feels warm to the hand, enough air has been present to allow the lacto bacilli to multiply rapidly, quickly making conditions too acid for the undesirable bacteria. Under these circumstances, lactic acid fermentation takes place, producing a silage which is light brown in colour, with a sharp but pleasant smell. The virtue of the lactic acid fermentation lies not in the food value of the lactic acid itself, but in the fact that the lactic acid preserves the silage by making conditions too acid for other bacteria to live.

If the temperature of the green material is too high, no undesirable fermentation takes place and a sweet dark-brown silage is produced. Although it is relished by stock, this silage has a relatively low feeding value because the heating to a high temperature changes the protein, rendering it indigestible and therefore of little value to animals.

What controls the temperature, which plays such an important part in the ensiling process? As has been pointed out, the temperature reached is determined by the time respiration is allowed to continue, which is governed by the amount of free air trapped in the green material. The amount of free air present is determined by the degree of consolidation of the material, which in turn is largely dependent on the moisture content of the material, the amount of trampling or rolling done and the rate of filling or stacking (or the weight of material above it).

A leafy succulent crop put in wet will pack tightly because of its weight, and it may contain so little air that respiration cannot continue long enough for the material to heat to the temperature required for the desirable fermentation to take place. Sour unpalatable silage will result. This can be avoided by putting the material in more slowly or allowing it to wilt slightly before carting it in.

On the other hand, mature pasture tends to be springy and difficult to compact because it is lighter and drier and the stems more hollow. Too much air becomes incorporated in the stack or pit, respiration continues for a longer period, the material gets too hot and losses of nutrients are very high. This difficulty can be overcome by cutting the crop before it becomes too mature—at an earlier stage than is general for hay—and by rolling with a tractor.

In practice, overheating of the green material is the more common of the two faults.

SIMPLE RULES

The points arising from the foregoing discussion may be summarized in a few simple rules for making good silage:

1. Cut the pasture in the leafy stage, preferably before any seed-heads appear.

2. Cut enough for one day at a time. Early in the season it may be desirable to leave very succulent material in the swathe for a time to wilt slightly. Late in the season, if the weather is hot, it is better to cut twice a day.

3. Aim at getting a temperature such that the green material feels warm to the hand.

4. If silage is made in a trench it may be necessary to leave the material harvested on the first day for 24 hours to heat up. Once the material in the base has heated, harvesting can proceed uninterrupted.

5. If the temperature becomes too high, consolidate further by rolling.

6. If succulent grass is put in in heavy rain, there is a risk of getting a layer of sour silage.

7. Spreading by fork will make feeding out easier and, by eliminating airpockets, will give a more uniform product.

8. Careful building of the sides and back of a stack will reduce wastage to a minimum.

RECENT DEVELOPMENTS

The main disadvantage involved in making silage has always been the work involved in handling heavy wet grass compared with the much lighter hay. The big increase in the popularity of silage in England and New Zealand and more recently in Australia, is undoubtedly largely due to the invention of machinery which has reduced the amount of labour required for silage-making. The two most popular silage-making implements introduced in recent years are the forage harvester and the buckrake.

1. The Forage Harvester

This is a machine which collects the mown material from the swathe or windrow, chops it into lengths from 1 in. to 4 in., and blows it into a trailer or truck which is towed behind or beside the harvester. When the collecting vehicle is full it is usually taken to a trench where it is emptied. Some makes of forage harvester have a cutter-bar attached so that the one unit performs the cutting, collection, and chaffing. In some cases the chaffed material is taken to an overhead silo and blown into it by another blower. The purchase of a forage harvester involves considerable outlay of capital, particularly as at least two and sometimes three vehicles are necessary to take the material to the storage if the forage harvester is to be kept working. For this reason the forage harvester would appear to be more suited to the requirements of a contractor or a large scale farmer than to the average dairy-farmer.

The forage harvester chops the pasture into short lengths and blows it into a trailer for transport to the silage storage.

2. The Buckrake

This implement enables a dairy-farmer who has a tractor with a hydraulic lifting system to make his own silage without having to employ outside labour or contractors and without having to invest money in expensive machinery.

Operation of the Buckrake

The buckrake is merely a steel or wooden sweep 7 to 9 feet wide with tynes 3 to 5 feet long and it fits directly onto the hydraulic lifting system of the tractor.

The tractor backs along the swathe until it has picked up its load of green material. The rake with its load is then raised to the carrying position by the hydraulic system of the tractor. The tractor then proceeds in a high gear to the stack or pit, runs over previously-dumped material and drops its load either with a trip mechanism or by lowering the rake to the pick-up position. The tractor then returns for another load. Only a small load, usually no more than 5 cwt., is carried, but under good conditions a large number of loads—up to 30—can be collected, transported and dumped in an hour.

STACK SILAGE OR TRENCH SILAGE

The farmer who intends to make silage with a buckrake must decide whether he will make it in stacks or pits. Each type of storage has its advantages. Some of the pros and cons of each method are listed to give an idea of the points to be considered.

Advantages of Trenches

1. Waste in the material is reduced because the sides are not exposed to the atmosphere.

2. Less fork work is required because the sides and back do not have to be " built ".

3. The earth removed from the pit can be used to cover the silage if desired.

4. Risk of accident is reduced because the tractor does not work high above the ground.

Advantages of Stacks

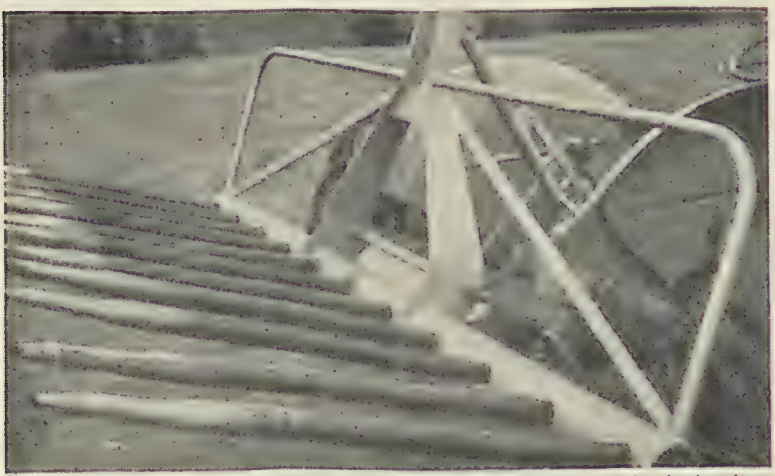
A. The size of a stack can be varied readily. This is advantageous because harvest yields vary from season to season. In a poor growing season a pit may be only half filled, while in a very good season the size of the pit may limit the amount of silage that can be made.

B. A stack can be made in any paddock, whereas a farmer using pits usually cuts only the nearby paddocks for silage. Empty pits are an eyesore, especially as they usually become overgrown with thistles and other weeds.

C. Unless a trench is well drained and has a firm bottom, the entrance and base of a trench are likely to become badly cut up when feeding out in the winter and early spring, whereas a stack can be fed out from four sides alternately if necessary.

Summing Up

Usually a silage-making programme using stacks is more flexible than when pits are used. This is an advantage because of the variability of other factors concerned. (See A and B above.) In practice, where short term conservation is intended, that is, where most of the silage is to be fed out within the next twelve months, stacks are more popular. Pits or trenches are a better proposition however where the silage is intended to be a long-term reserve for drought years and where no labour is available for spreading the material.



The buckrake is actually a sweep that works directly from the hydraulic lifting system of the tractor.

A loaded buckrake being driven to a pit or stack. An average load weighs 4 to 5 cwt.

CHOOSING THE SITE

Some of the factors to be considered when choosing the site for a stack or pit are :—

(*a*) A tractor with a loaded buckrake can carry a bigger load down hill than up hill ;

(*b*) If the stack or pit is near the centre of the paddock the average cartage distance is smaller than if the stack is in a corner or at one end of a long paddock ;

(*c*) If the silage is near a gate, the paddock is less likely to be cut up when feeding out to other paddocks in winter and early spring ;

(*d*) Fencing is saved if the silage is made in a corner or against a fence ;

(*e*) A sloping, well-drained site is advisable if the silage is to be fed out in wet weather. A wedge shaped stack built on sloping ground is more compact than if built on flat ground ;

(*f*) If possible, a pit should be accessible from more than one paddock so that the same paddock is not cut every year.

The relative importance of these factors will vary from farm to farm and from paddock to paddock. For instance, on flat small paddocks (*a*) and (*b*) will be unimportant. The answer must be a compromise which may be different in each paddock.

SIZE OF PITS AND STACKS

1. Wedge-shaped stacks are usually made about 18 feet wide, this being twice as wide as a buckrake. This means that loads can be dumped side by side and little spreading is required. A few farmers prefer to make stacks one buckrake width only, while farmers making big stacks find it more convenient to make the stack as wide as three loads, that is, 25–30 feet. The length of the completed stack will depend on the amount of material put into it. As the high end gets higher the stack must be made longer or it will be too steep for the tractor to back up it.

2. Pits into which a tractor and buckrake are driven are usually made about 18 feet wide at the top. Sides should have a batter of about 1 foot in 6 or 7 feet. This is essential for proper consolidation of the material on the sides.

The length of the pit depends on the size of the paddock. A pit 18 feet wide at

the top, 16 feet at the bottom, and 6 feet deep, will hold 6 to 7 tons of silage for each yard of its length.

The average per acre yield of pasture when cut for silage is 6 tons of green material. This yield of green material gives approximately 4 tons of silage per acre.

Where, as is usually the case, the trench is on the side of a slope, the top end of the trench should be sloped so that the tractor can run right through the excavation and more effectively consolidate the material.

SHAPE OF STACKS

The wedge-shaped stack has so far proved to be the most popular type of stack both in Australia and overseas. If this stack is built carefully with suitable material there is only a few inches of waste on the top and sides. However, a certain amount of "building" must be done to keep the sides straight and firm and, in order to eliminate some of the labour required, a number of farmers have made bun or mushroom-shaped stacks. These are really just mounds or round heaps and are usually no more than 4 or 5 feet high when settled. They take up a bigger area and consequently require more fencing than wedge stacks, but, because the tractor can run all over them, it is claimed that better consolidation is achieved and hence there is less wastage. Also, as there are no sides to build, less fork work is required, although a certain amount of spreading by hand is still necessary if the silage is to be of good quality.

Quite a number of farmers have tried both these methods and opinions still differ as to which is preferable. The answer may be that the wedge is more suitable on sloping ground and the bun has more advantages on flat ground.

Other types of stacks such as the double-ended wedge or ramp are made. These are in effect two wedge shaped stacks back to back. This type of stack also has straight sides which require building, but, in the early stages at least, the tractor can run straight over the stack without stopping to back up. This stack can be built between temporary or permanent walls of steel, wood, or concrete and in this case wastage on the sides is reduced, no "building"

Reversing the tractor up a partly-built wedge stack to deposit still another load. Travelling thus over the stack consolidates the material and assists in temperature control (see text, page 388).

The double-ended wedge or ramp stack (top picture). In the early stages of its building the tractor can be run right over it to deposit one load and return for the next. The lower picture shows a bun or mushroom-shaped stack. As it is circular, a tractor may be driven on to the stack from any direction effectively consolidating the material.

is required and risk of the tractor slipping off the stack is reduced. This type of stack can also be built like a dam across hollows or small gullies but the problems likely to be encountered when feeding out should be considered and some provision should be made for drainage.

MAKING A WEDGE-SHAPED STACK

1. Commence by dropping loads on the part of the stack that will be highest. On sloping ground this will be the lower part of the slope.

2. As it becomes necessary, dump loads in front so that a small ramp is formed. It is preferable to spread each load to some extent.

3. Back up the ramp dumping loads on the back so that this remains the highest part of the stack. As it becomes higher more loads must be dropped in front so that the slope is not too steep for the tractor to back up. The stack thus becomes longer as it gets higher.

4. The stack is thus built in layers, the first loads of each new layer being dumped at the high end; succeeding layers in front of it.

5. The high end should be sloped inwards slightly so that it will settle without an overhang. The two sides should be kept vertical, as straight as possible and consolidated by trampling.

"SELF SEALING"

It has been the practice in the past to cover silage in stacks and pits with a layer of earth up to 18 inches thick. The earth performed two functions. It formed a seal preventing the entrance of water and air into the silage and its weight consolidated the upper layer of material. It has been found that this earth cover is unnecessary where the tractor can run over the silage if the material in the top layer is green and leafy.

The practice known as "self sealing" consists of rolling the stack after it is completed until a mushy layer is produced a few inches below the surface. When this mushy layer dries out a scab or crust is formed which effectively seals the stack against the entrance of water and air. As the rolling consolidates the material in the top portion of the stack, there can be as little as 3 inches of waste on the top

Commencing construction of a wedge-shaped stack. The first loads are dropped at the end which will be the highest point above ground level.

if suitable green leafy material is used. The amount of rolling required varies, but usually an initial rolling of an hour followed by half an hour a day for the next three or four days is sufficient.

If, for some reason, a paddock is to be cut later than at the optimum stage, it is not always possible to have the leafy material necessary to make a good seal. Some farmers have overcome this problem by erecting an electric fence around a small area of the paddock, say half an acre, and grazing this three or four weeks before harvesting. The regrowth from this area is then succulent and leafy and is suitable for sealing the top of the stack. This type of seal is very satisfactory when silage is to be used within a few months, but enough is not yet known of its durability to be able to recommend its use on silage which is to be kept for more than one season. For long-term storage it would be advisable to cover silage with a layer of earth.

FEEDING OUT

Most of the silage made in Victoria is fed out in the summer months in an attempt to arrest the decline in production which always occurs as conditions become too hot and dry for pasture to grow. Silage can form a relatively large part of the daily diet of cows but they must first acquire a taste for it.

The daily intake of silage by a herd will usually increase day by day for at least a week after the commencement of feeding out. The most effective method of keeping production up is to start feeding a little out each day before production falls so that the cows get into the habit of eating it. Then, as the pasture deteriorates, the silage ration can be gradually increased until the herd is eating as much as it will clean up. The usual method of getting the silage out of the stack or pit is to work with "benches" 4 to 8 feet wide and, after making a cut 6 to 8 inches deep, to fork off the silage in layers. The various tools used to do the cutting include the axe or broad-axe, sharpened spade, hay knife, and various types of home-made implements. Farmers who have used a recently imported implement designed especially for the job give it enthusiastic praise.

Feeding out time is an opportune stage to observe the quality of the silage and the amount of wastage and to try to relate them to the conditions at harvesting. If

A wedge-shaped stack after settling.

A buckrake load of mown pasture being deposited in a partly-filled trench.

there is a sour layer at the bottom of the stack or pit, the first day's material was probably not allowed sufficient time to heat before proceeding with the rest of the storage. If the material is dark and sweet, much feed value has been lost through over-heating. This may have been caused by the material being too mature, being put in too slowly, or not being sufficiently consolidated. An undue amount of waste on the sides, or uneveness in the material may be an indication that more spreading by pitch fork would have resulted in better silage and less waste. If a rough brief diary is kept at harvest time it may prove useful when feeding out to remind the farmer of details of harvesting conditions that might otherwise be forgotten.

SILAGE AND THE BUCKRAKE

As the buckrake carries a relatively small load (approximately 5 cwt.) it is not a fast method of harvesting and many farmers will ask the question—"How much silage can I expect to make with a buckrake in a season?"

Harvesting rates vary considerably, but a farmer with one tractor can reasonably expect to be able to mow and cart in at least an acre between milkings—some farmers have cut and harvested as much as 5 acres between milkings under very good conditions.

This means that in an average season in most dairying districts at least 15 acres can be harvested. This should give about 60 tons of silage. This enables a 30 cow herd to be fed 50 lb. of silage per cow per day for nearly three months—say two months in the summer and one month in the early spring.

These estimates are conservative, as some Victorian dairy farmers harvested more than 30 acres last season with one tractor. However, they prove that, although the buckrake is a relatively cheap and simple implement, it enables a farmer with his tractor to harvest at a moderate cost a proportion of his spring surplus growth as a high quality feed-stuff.

As a food, silage is cheaper than bought-in concentrates and, as a method of harvesting, silage-making with a buckrake is cheaper than getting hay baled by contract.

CONCLUSION

A silage making programme achieves an evening-out of the feed supply to the herd during the season. It permits the herd to be fed most economically at a high level for a longer period than applies on the average dairy farm because :—

1. Pastures are controlled and therefore improved.
2. The regrowth on paddocks cut for silage is available early in the summer as high quality pasture.
3. The silage itself can be fed at times when pasture does not meet the requirements of the milking herd.

Modern methods of silage-making, particularly the buckrake, enable the mechanised farmer to make a worthwhile quantity of silage without the employment of seasonal labour. The resulting better utilization and management of pasture must result in increased production, bigger returns, and greater efficiency on our dairy farms.

Quality Characteristics of the Victorian Wheat Crop

By E. J. O'Brien, B.Sc., A.A.C.I., Senior Chemist,
and H. J. Moss, B.Sc., A.A.C.I., Chemist

SEASON 1952-53

DURING the wheat harvest, samples were taken representing weekly deliveries to each grain elevator in Victoria and that part of New South Wales served by the Victorian rail system. A detailed report concerning these samples has been made to the Victorian Grain Elevators Board and copies were made available to other interested bodies.

This report summarizes the results of testing 1,003 individual samples representing 203 elevators and generally assesses the quality of Victorian wheat for the 1952–53 harvest.

REVIEW OF 1952-53 SEASON

The climatic conditions which prevailed during the season have already been published in reports of the wheat crop competitions for 1952 in the April issue of this Journal.

Apart from wet conditions during sowing, which in some cases restricted the acreage sown, conditions were generally favorable. Cool conditions prevailed right up to harvesting, which on that account was later than usual. Weed growth was troublesome and resulted in more Melilotus indica in the wheat than is usual in Victoria. While this was largely due to peculiar climatic conditions favouring the growth of Melilotus, introduction into the harvested grain could have been reduced by greater care during harvesting operations.

The wheat yield per acre was the highest for many years, making the eighth, successive good year.

WHEAT VARIETIES

Varietal trends noted last year have continued. Insignia has now replaced Quadrat as the most popular variety and the area sown to Pinnacle has further increased. Insignia and Pinnacle are both superior in baking quality to Quadrat, Magnet, and Bencubbin. The acreage sown to Gabo has been maintained; Gabo is a high quality variety introduced from New South Wales.

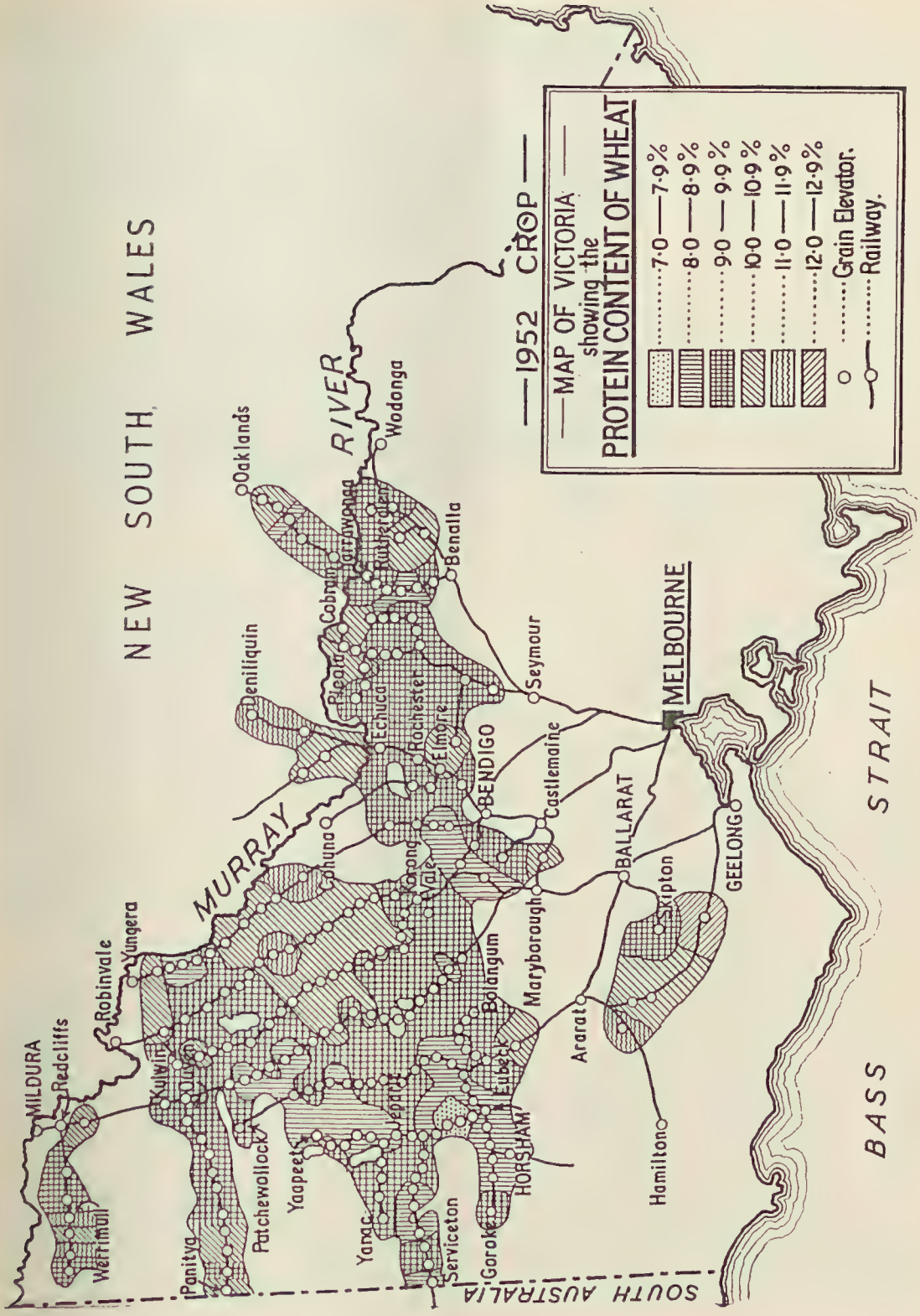
TABLE 1.—WHEAT PRODUCTION IN VICTORIA.
(Grain only.)

Year.	Area.	Production.	Yield.
	Acres.	Bushels.	Bus./ac.
1943–44	1,793,428	19,733,322	11·0
1944–45	2,141,729	3,407,677	1·6
1945–46	3,251,393	29,633,760	9·1
1946–47	3,501,135	48,070,908	14·0
1947–48	3,227,162	46,962,385	14·6
1948–49	2,995,705	49,036,560	16·4
1949–50	2,828,273	57,433,835	20·3
1950–51	2,735,473	51,235,929	18·7
1951–52	2,463,574	45,994,752	18·7
1952–53*	2,275,000	50,500,000	22·2
Average for 10 years ending 1939	2,988,795	40,380,602	13·5
Average for 10 years ending 1952	2,750,637	40,395,021	14·7

* Estimate only.

PROTEIN DISTRIBUTION

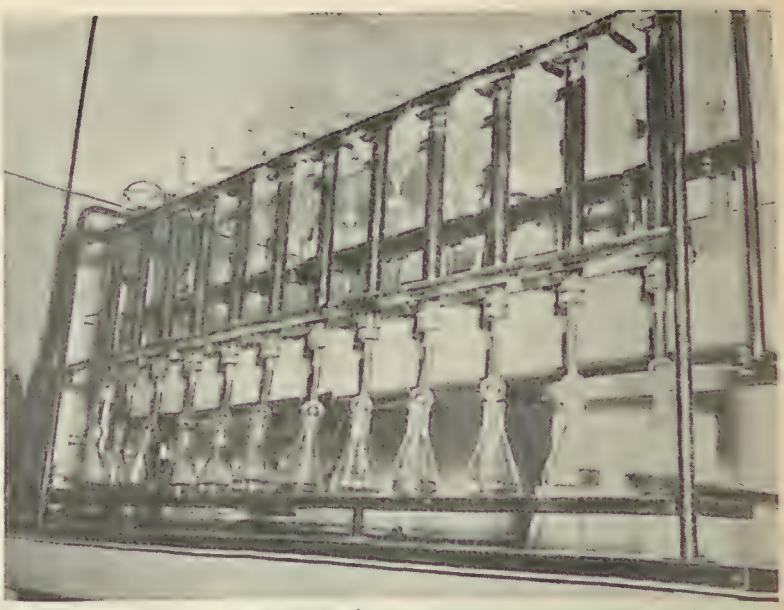
The protein map was constructed after testing representative samples from all parts of the main wheat belt. Weighted mean protein figures were determined for each silo and bulkhead, and plotted on the map, giving a broad outline of protein distribution. The distribution again shows that soil and climatic conditions are the dominant factors governing protein content. As usual, the highest protein wheat was found in the eastern Mallee and the lowest in the southern Wimmera.



1952 CROP
MAP OF VICTORIA showing the PROTEIN CONTENT OF WHEAT
7·0 — 7·9%
8·0 — 8·9%
9·0 — 9·9%
10·0 — 10·9%
11·0 — 11·9%
12·0 — 12·9%
Grain Elevator.
Railway.
NEW SOUTH WALES
MURRAY RIVER
SOUTH AUSTRALIA
BASS STRAIT
MELBOURNE
BENDIGO
BALLARAT
GEELONG
HORSHAM
MILDURA
Oaklands
Wodonga
Benalla
Seymour
Castlemaine
Maryborough
Ararat
Hamilton
Skipton
Robinvale
Yungera
Redcliffs
Werrimull
Panitya
Patchewollock
Yaapeet
Yanac
Serviceton
Goroke
Jeparit
Eubeck
Bolangum
Cohuna
Korong Vale
Echuca
Rochester
Elmore
Pleata
Cobram
Tarrawonga
Rutherglen
Deniliquin
Kulwin
Duyen

The average protein figure was 9·4 per cent., an increase of 0·2 per cent. over last year. This represents a range of from 7·2 to 12·6 per cent.

The results shown on the map are presented in greater detail in Tables 5 to 9 where the elevators in the various districts are grouped according to their protein content. The proportion of the district and of the State represented by each group is also shown and these are plotted in figure 1. From this figure it can be seen that 30 per cent. of the crop falls below 9 per cent. protein, the level which is regarded as the lowest that can provide satisfactory flour for bread-making.



Nitrogen distillation apparatus used in determining protein content of wheat.

TABLE 2.—WHEAT VARIETIES SOWN IN VICTORIA.
(Percentage of Total Area.)

Variety.	1952–53.	1951–52.	1950–51.	1949–50.	1948–49.
Insignia ..	38·3	30·4	22·5	21·0	11·8
Quadrat ..	32·0	36·4	38·3	44·8	47·2
Pinnacle ..	17·8	15·8	15·0	8·0	4·8
Magnet ..	2·8	4·0	6·1	5·8	7·2
Bencubbin ..	2·4	4·7	7·1	6·7	7·3
Gabo	1·6	1·5	0·7	0·5	0·1
Baldmin ..	1·3	1·8	1·5	1·3	1·2
Pindar ..	0·9	1·4	2·0	3·0	5·7
Ghurka ..	0·6	0·9	1·5	2·9	7·1
Diadem ..	0·4	1·0	2·0	2·4	1·3

TABLE 3.—LEADING WHEAT VARIETIES SOWN IN DISTRICTS.
(Percentage of Wheat Area.)

Mallee.		Wimmera.		Northern.	
Insignia ..	59·0	Quadrat ..	36·3	Quadrat ..	42·1
Quadrat ..	26·7	Pinnacle ..	35·8	Pinnacle ..	21·4
Bencubbin ..	4·1	Insignia ..	20·8	Insignia ..	14·5
Gabo ..	2·8	Magnet ..	4·5	Baldmin ..	7·3
Pinnacle ..	2·8	Ghurka ..	0·6	Magnet ..	5·8

ANALYTICAL AND BAKING RESULTS

Composite samples representing the groups shown in Tables 5 to 9 were prepared and the results are set out in Table 10. The wheats were milled on an experimental mill to give flour yields comparable with that obtained commercially.

The results tabulated may be regarded as typical of deliveries, within the protein ranges listed, from the various districts. Although varietal differences are present, as shown in Table 3, and the effect of variety is clearly shown by comparing columns 2 and 8 in Table 10, protein content remains the limiting factor governing bread quality in Victoria.

The farinograph and extensograph data indicate that all the flours may be classified as weak by world standards; the Pelshenke figure, which was obtained on the wheat meals, confirms this rating.

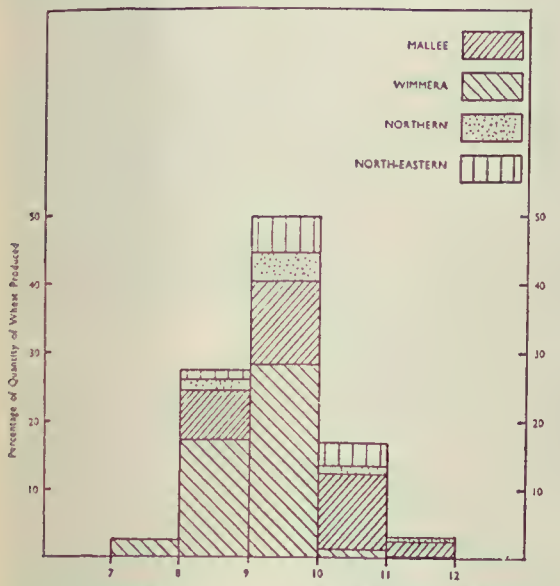
TABLE 4.—SEASONAL PROTEIN VARIATION.
(Calculated on 13·5 per cent. moisture basis.)

Year.	1952–53.	1951–52.	1950–51.	1949–50.	1948–49.	1947–48.
Number of elevators sampled ..	203	187	148	149	149	143
Protein content (average) ..	9·4	9·2	8·7	10·1	10·5	9·5
Protein content (variation) ..	7·2–12·6	7·0–12·7	7·0–11·0	6·7–12·9	7·4–14·1	6·9–14·9
Protein content (range)	5·4	5·7	4·0	6·2	6·7	8·0
Protein content (f.a.q. sample) ..	9·6	9·3	8·7	9·9	10·3	9·6

TABLE 5.—NORTHERN ELEVATORS.
(Protein Content.)

% 11·0–11·9	% 10·0–10·9	% 9·0–9·9	% 8·0–8·9
Deniliquin Mathoura	Barrakee Boort Bunnaloo Elmore Womboota	Borung Buckrabanyule Dingee Goornong Hunter Leichardt Mitiamo Moolort Rochester Shelbourne Warragamba Wedderburn Wychitella	Bridgewater Llanelly Raywood Tandarra
District % 0·9	18·1	56·2	18·8
State % 0·5	1·3	4·1	1·4

The farinograph measures the mixing tolerance of a flour whilst the extensograph measures the stress-strain relationships existing in a standard dough piece. As bread doughs must stand a considerable amount of mechanical work in mixing, handling and fermentation, and as the working tolerance of these flours is small, it is obvious that the best bread will be produced by short mixing consistent with thorough incorporation, and mild handling in the bakery. The extensograph data shows that the flours are somewhat superior to those of comparable protein content from last season's crop. This is likely to result in better crumb structure and a bolder upright loaf.



Frequency diagram showing percentage of total wheat produced falling within each 1 per cent. protein range.

The maltose figure again shows that the flours are deficient in diastatic enzymes necessary for normal fermentation. Consequently malt flour additions are essential for commercial bread production.

TABLE 6.—NORTH-EASTERN ELEVATORS.
(Protein Content.)

% 10·0–10·9	% 9·0–9·9	% 8·0–8·9
Cobram Colbinabbin Katamatite Katunga Peechelba Sanger Strathmerton Waaia Wangamong Wangaratta	Cosgrove Dookie Goorambat Murchison East Nagambie Nathalia Numurkah Picola Pine Lodge Rutherglen Sloane Springhurst Tallygaroopna Telford Tungamah Warragoon Wunghnu Yabba North Yarrawonga	Devenish Rennie St. James Youanmite
District % 32·4	53·8	13·9
State % 3·4	5·6	1·4

TABLE 7.—WIMMERA ELEVATORS.
(Protein Content.)

% 10·0–10·9	% 9·0–9·9	% 8·0–8·9	% 7·0–7·9
Glenloth Glenorchy Massey Morton Plains	Antwerp Banyena Batchica Bolangum Brim Charlton Cope Cope Detpa Donald Gerang Gerung Goroke Jackson Kaniva Kiata Lah Landsborough Lillimur Litchfield Lorquon Lubeck Marnoo Netherby Nhill St. Arnaud Salisbury Sheep Hills Swanwater Warracknabeal Watchem Wycheproof Yanac	Arkona Burrum Coromby Diapur Dimboola Dooen Ellam Horsham Jeparit Jung Minyip Miram Mitre Murtoa Natimuk Noradjuha Nullan Remlaw Rupanyup Serviceton Sutherland Tarranginnie Tarranyurk Vectis	Dahlen Pimpinio Wail
District % 1·3	58·0	35·1	5·6
State % 0·6	28·2	17·1	2·7

The baking results are a summation of the points allotted to various factors, such as volume, crumb, and crust, which make up a loaf of bread; a perfect loaf would score 100 per cent. At optimum fermentation, the loaves confirmed the extensograph interpretation and this is reflected in the higher loaf scores for this season. It should be emphasized that although the doughs require a minimum of mechanical work, they need proper fermentation for full development. Under or over fermentation both result in poor bread quality.

The over-all quality picture for this season is somewhat better than one would expect from the small increase in protein content over that of last year but it is not possible to attribute this quality effect to any simple cause. For practical purposes the quality may be considered as virtually unchanged from last year; no alteration to procedures or techniques for any baking purpose should be necessary.

TABLE 8.—MALLEE ELEVATORS.
(Protein Content.)

11·0–11·9 %	10·0–10·9 %	9·0–9·9 %	8·0–8·9 %
Kerang	Annuello	Albacutya	Beulah
Karween	Barraport	Birchip	Galaquil
Lalbert	Berriwillock	Boigbeat	Hopetoun
Meatian	Cannie	Bolton	Lascelles
Yarrara	Carwarp	Carina	Miralie
	Cowangie	Chillingollah	Natya
	Culgoa	Chinkapook	Pullut
	Curyo	Galah	Rainbow
	Dumosa	Gama	Speed
	Gredgwin	Gowanford	Turriff
	Kinnabulla	Goyura	Woomelang
	Kooloonong	Karawinna	Yaapeet
	Lake Boga	Kiamal	
	Meringur	Kulwin	
	Mittyack	Linga	
	Murrayville	Manangatang	
	Mystic Park	Morkalla	
	Nullawil	Nandaly	
	Panitya	Nyah West	
	Pira	Nyarrim	
	Quambatook	Ouyen	
	Swan Hill	Patchewollock	
	Ultima	Piangil	
	Warne	Pier Millan	
		Rosebery	
		Sea Lake	
		Tempy	
		Torrita	
		Tutye	
		Underbool	
		Waitchie	
		Walpeup	
		Watchupga	
		Werrimull	
District % 7·1	33·6	36·4	22·8
State % 2·3	11·0	11·9	7·5

TABLE 9.—WESTERN ELEVATORS.
(Protein Content.)

12·0–12·9 %	11·0–11·9 %	10·0–10·9 %	9·0–9·9 %
Berrybank	Willaura	Westmere Tatyoon	Skipton
District % 0·5	31·4	60·5	7·6
State % 0·0	0·3	0·6	0·1

TABLE 10.—ANALYTICAL RESULTS.

—	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
—	Wimmera.		Mallee.			Northern.		North Eastern.		Western.
Wheat Protein (Range) per cent.	7·0–8·9	9·0–10·9	8·0–8·9	9·0–9·9	10·0–11·9	8·0–9·9	10·0–11·9	8·0–9·9	10·0–10·9	9·0–12·9
Wheat Protein (13·5% Moisture) per cent.	8·4	9·6	8·6	9·6	10·3	9·4	10·3	9·2	10·4	11·1
Pelshenke figure .. .. minutes	41	41	38	42	55	35	46	41	38	49
Flour Protein (13·5% Moisture) per cent.	7·4	8·4	7·8	8·3	9·4	8·1	9·3	8·2	9·1	9·9
Wet gluten .. .. .. per cent.	22·0	27·5	24·0	26·0	29·3	26·5	29·0	26·5	29·5	30·0
Dry gluten .. .. .. per cent.	7·3	8·6	8·0	8·6	9·6	8·4	9·5	8·5	9·3	9·5
Farinograph—										
Water absorption .. per cent.	55·8	56·4	57·8	58·8	59·2	57·0	59·2	56·0	58·0	57·8
"E" figure .. .. minutes	3·0	3·5	3·5	3·5	3·5	3·0	3·5	4·5	4·0	4·0
Valorimeter Number	32	34	36	36	38	34	38	40	40	38
Extensograph Area .. square inches	12·2	12·2	9·8	13·9	12·7	11·2	11·9	16·9	12·2	19·6
Maltose figure (mgms. maltose per 10 gms. flour)	88	90	101	96	83	83	93	101	93	78
Loaf Score .. .. .. per cent.	59	63	58	69	72	64	65	74	73	75

(continued on page 432.)

Minimizing Losses From Bloat

By K. M. SILLCOCK, B.Agr.Sc., Senior Dairy Husbandry Officer

Bloat in cattle can be a serious problem to the dairy farmer and may cause interference with his work and cause him to lose both time and production. It can be particularly troublesome in areas of newly-established pastures, as has been the case in some of the soldier settlement areas in Victoria. In the following article, the author suggests some changes in farm management which may help the stock-owner to lessen the risk of bloat in his herd. An article entitled "Bloat in Cattle", appearing on page 404 of this issue, describes how to treat animals affected with bloat.

THE causes of bloat are not yet fully known, but there are circumstances which tend to initiate its onset, and these can sometimes be eliminated by changes in farm practice.

The main predisposing causes of bloat seem to be—

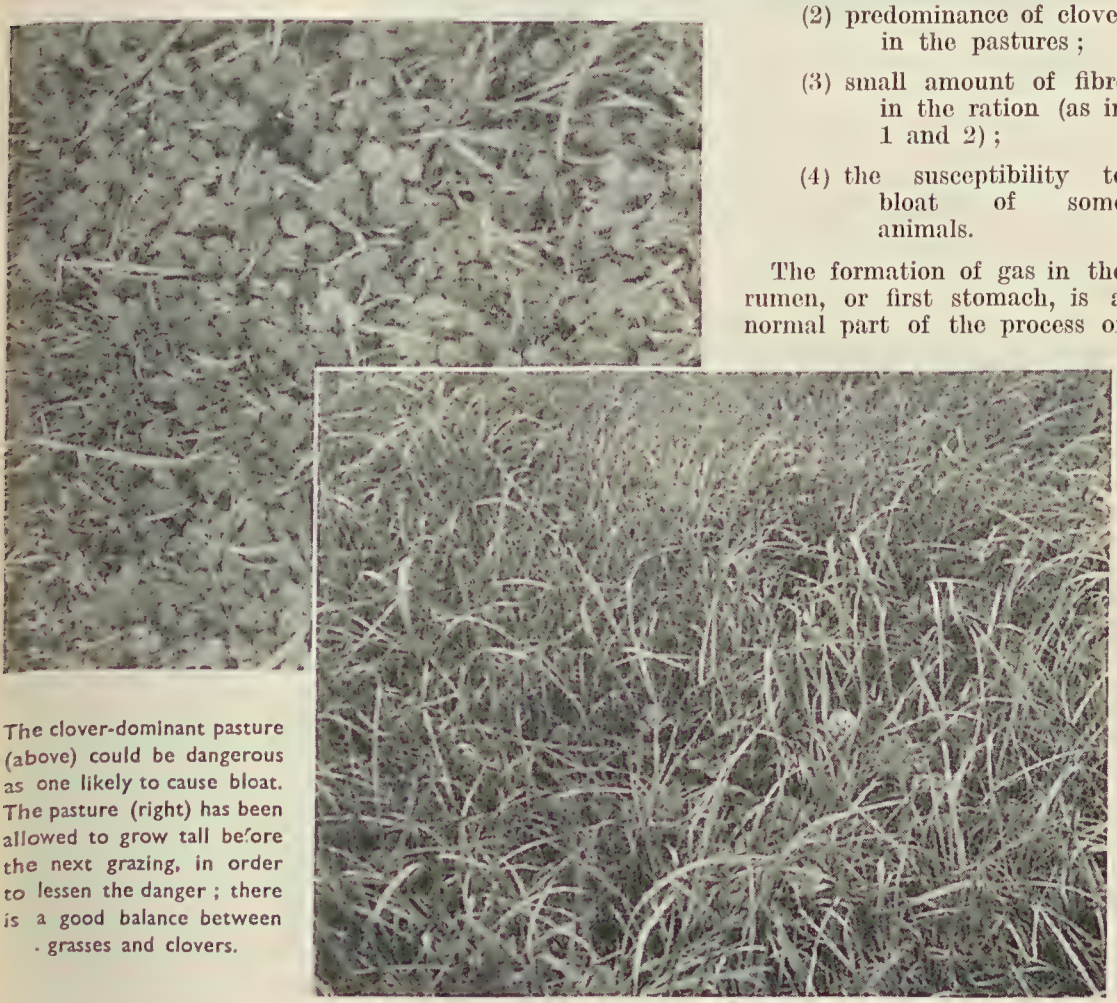
(1) the rapid grazing of young, quickly-growing pastures;

(2) predominance of clover in the pastures;

(3) small amount of fibre in the ration (as in 1 and 2);

(4) the susceptibility to bloat of some animals.

The formation of gas in the rumen, or first stomach, is a normal part of the process of



The clover-dominant pasture (above) could be dangerous as one likely to cause bloat. The pasture (right) has been allowed to grow tall before the next grazing, in order to lessen the danger; there is a good balance between grasses and clovers.

When there is a danger of bloat, take the edge off the cows' appetites by feeding them hay or chaff before they return to their grazing after milking time.

digestion, and the cow gets rid of the gas simply by belching it up. The abnormal condition in bloat is not so much the formation of the gas but the inability of the cow to get rid of it.

Theories

One theory is that the belching action occurs when the walls of the rumen are stimulated or tickled by the movement of fibrous food within it. When leafy young pastures containing much clover are grazed, there is very little fibre in the food, and this stimulation of the rumen wall does not occur.

Another theory is that toxic substances are present in the feed, or are produced from it, which interfere with the belching mechanism. There may be some truth in both theories. There is also, of course, the possibility of some foods producing gas at a faster rate than usual, especially when a large quantity of food has been eaten quickly.

Whether the explanations are correct or not, certain farm practices help to eliminate or lessen the danger of bloat.

Prevent Hunger

If there is hay on hand, the hunger of the cows can be reduced by feeding it to them before they return to the pastures after each milking. This will reduce their hunger. They will afterwards graze the pastures more slowly. It would probably be useless to put the hay out in the paddocks, as the cows may ignore it, whereas they would be more likely to eat it if it is offered, say, in racks in a holding yard where no grazing is available.

Control Pasture Composition

Grazing management can alter the composition of the pastures and make them less dangerous as causes of bloat.

If a section of pasture is eaten down often, the grasses are continually losing their leaves and are weakened. The clovers, with leaves closer to the ground, will become predominant in a short time, and this will increase the risk of bloat.

If cows are given the run of a large paddock they will pick it over at first, and thereafter they will concentrate on the portions which have been grazed short and ignore the longer pasture on other parts of the paddock. This can be prevented by adequate subdivision of the farm and the adoption of a system of controlled grazing. The object of this system is to graze each pasture down quickly and then rest it until it has grown fairly high (from at least 4 up to 9 inches) before grazing it again. Usually at least three weeks' rest between grazing is needed, but the resting time depends on the rate of growth of the pasture. When long pastures are grazed, the cows take in less leaves and more stems, and so their rations contain more fibre. This type of grazing also maintains a good balance between grasses and clovers.

It should be realized that too short a rotation can be dangerous. For instance, if the herd were to graze a paddock for a day once a week, or even once a fortnight, there would be a tendency to weaken the grasses and encourage the clovers.

On a very "dangerous" pasture the risk of bloat was lessened by allowing the cows to graze only a yard-wide strip at a time. The work of moving the electric fence several times a day was preferred to treating acute cases of bloat. In this instance two electrified wires were used ; the usual practice is to employ one.

Cows made to Eat Stems

Even under controlled grazing some pastures, particularly those newly established, are still dangerous. Faced with this problem, a New Zealand scientist, Mr. P. Sears, made a further attempt to reduce an acute bloat problem by strip grazing. A portable electric fence was set up so that the cows had access to a strip of pasture only a yard wide. The object of so confining their activities was to make them eat the whole pasture instead of picking off only the leafy portions.

After each strip was grazed down in this way, the fence was moved to another line, a yard distant from the first. It was found that there was much less bloat when the fence was moved in this way, seven times during the day and two or three times during the night. An alternative method was to cut a swathe of pasture, push it into a windrow with a side-delivery rake, and then use the electric fence to keep cows off the uncut pasture.

Obviously, few farmers would be prepared to carry out this programme for any length of time. But, where this experiment was carried out the bloat problem was so acute that the owners were compelled, in any case, to be almost constantly with the herd. Perhaps, in less dangerous pastures, it may suffice to restrict the cows to a narrow strip at the commencement of grazing, after which they could be given a wider strip.

Some Cows more Susceptible

There is no doubt that some cows are more susceptible to bloat than others. This has been clearly demonstrated in identical twin cattle grazed on different pastures on the same day. It is not known whether this susceptibility is due to grazing habits (for instance, a tendency to pick off the tops of the pasture plants) or to some peculiarities in the digestive systems of the susceptible animals. In ordinary farm practice, such cows may need to be specially watched, but they may also serve as a warning that the rest of the herd is endangered. Susceptible cows with some experience may learn to come to the farmstead for treatment or to treat themselves when slightly bloated. For instance, cows in the irrigation areas often seek relief by standing with their forefeet on the bank of a main channel. The elevated position of the fore end seems to help them to get rid of the gas.

More investigation is needed, and is being done on the problem but, until more is known about it, the farm practices outlined offer some relief. When science finds the real causes, we will perhaps learn how to keep our herds completely free from bloat.

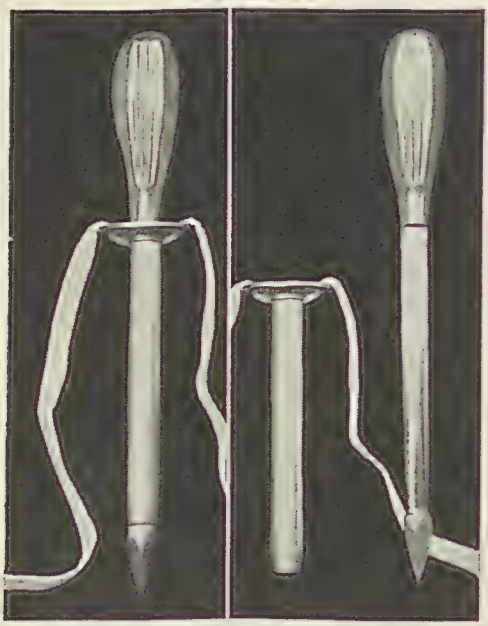
(See article overleaf, dealing with the treatment of bloat in cattle.)

After the escape of the stomach gases, medicines may be poured through the cannula by attaching a rubber tube and the use of a funnel directly into the rumen, if considered necessary.

To prevent any possible infection of the wound, the trocar should be re-inserted into the cannula before that instrument is withdrawn, to remove any food or other foreign matter that may have passed into it.

Puncturing the rumen with the sterilized trocar and cannula.

Less extreme cases may be treated by medicine administered for the purpose of removing gas already formed, and reducing fermentation. Various remedies are in almost daily use for the treatment of earlier, milder cases. Bi-carbonate of soda with ginger, Stockholm tar, &c., have all been used with some success, but perhaps better results would be obtained from the use of sodium hyposulphite, at the rate of 2 to 5 oz. in 1 pint of water, or 1 oz. formalin in 1 pint of water, or a mixture of 2 oz. pure turpentine, with 15 to 20 drops of oil of peppermint in 1 pint of raw linseed oil. In cases of frothy bloat, new surface-active agents possessing pronounced anti-frothing properties, can be given either through the trocar or by mouth. Whatever treatment is used, it should be followed by administering a stimulant such as carbonate of ammonia 1 oz. and nux vomica 1 dram, repeated in four hours.



Left, the trocar and cannula as inserted; centre, the cannula with tape for tying round the barrel of the animal, and right, the trocar.

It should be borne in mind, however, that wise supervision and management can to a very large extent minimize the losses, and the consequent expense caused by bloat in cattle. The dangerous cases met with when stock are grazed on rich clover and lucerne pastures indicate clearly the necessity for precautionary measures. Stock should not be put on to these growing, lush pastures while hungry, or in the early morning, when the pastures are cold and soaked with moisture. For the first few days they should be kept under observation, even if allowed on the pastures for short periods only. The risk is further minimized if the stock are fed prior to being put out to graze. For this feeding, chaff or meadow hay is satisfactory. Longer grazing periods may be allowed as the animals become accustomed to the pasture.

The two main precautionary measures therefore, are (1) not to graze stock on growing clover pastures which are wet and cold, and (2) feed cattle as prescribed previously, before allowing them to graze. (For further information on preventive measures, see article "Minimizing Losses from Bloat," on page 401 of this issue.)

PENICILLIN FEEDING TRIALS WITH CHICKENS

State Research Farm Werribee

By I. J. Stewart, B.Ag.Sc.,
Live Stock Research Officer

In view of the current interest of poultry farmers and others in the use of anti-biotics for feeding to young poultry stock to increase growth rates, trials were inaugurated at the State Research Farm, Werribee. In the first of these trials in 1951, wet penicillin mycelium was used with good results, but it was apparent that the use of such a material in the field was limited. The trials reported in this paper are those carried out in July-September, 1952, using crystalline procaine penicillin.

RESULTS of a feeding trial adding penicillin to mashes fed to chickens from day-old to 14 weeks of age gave the following indications:

1. The addition of 8 grams of procaine penicillin per ton to an ordinary chick ration increased the growth rate and the efficiency of feed utilization;

2. The results obtained with an ordinary ration plus penicillin were about the same as those obtained with the good ration containing 5 per cent. dried buttermilk;

3. The addition of penicillin to a good chick ration containing 5 per cent. dried buttermilk did not increase the growth rate but it did increase the efficiency of feed utilization;

4. The addition of penicillin to a low-protein ration produced better results than a low protein ration alone, but did not attain results obtained with an ordinary ration without penicillin;

5. Mortality rates in all groups were higher than normal due to the use of a stale vitamin D3 supplement which precipitated an outbreak of rickets. Groups fed penicillin had a lower mortality from rickets than those not fed penicillin. Apart from this effect of penicillin the protein content of the ration also influenced the mortality; deaths from rickets increased considerably from the high to the low protein rations, indicating the general effect of a good ration under such circumstances.

6. Two other groups also received the ordinary ration plus vitamin B12 (animal protein factor) one with, and one without, the addition of penicillin. Both these groups were slightly better than the ordinary ration alone and the group containing vitamin B12 and penicillin was almost as good as the group on the good ration plus penicillin. This trial is of academic interest only as vitamin B12 is not available in Australia at present.

Results 1 to 5 are interesting to all practical poultry farmers in view of the current interest in the use of anti-biotics in chick mashes. Procaine penicillin was the anti-biotic used because it is practically the only one available to Australian farmers and forms the basis of all commercial anti-biotic chick mashes and mash supplements.

The amount used—8 grams per ton—is probably a fair estimate of the amount used commercially and is considered an optimum level at present. There are three types of anti-biotic supplement available on the market—chick mashes and pellets containing anti-biotic, pre-mixes or supplements for adding to mashes made up on the farm, and tablets or powder for adding to drinking water or to water used to mix wet mash. Each of these types, on its own, supplies sufficient anti-biotic. It is extravagant to use more than one as little additional effect is produced.

In these experiments groups of 117 Australorp cockerel chickens were used. They were brooded in electric battery brooders for a fortnight, transferred to the floor under hover brooders to six weeks of age, and then kept in pens without heat to 14 weeks of age. Once on the floor the chickens had an outside run, but with little green feed available on it.

The ingredients used in the mashes were as shown in Table 1.

TABLE 1.

	Good.	Ordinary.	Low Protein.
Ground Wheat	45	50	55
Maizemeal	10	10	10
Ground hulled oats ..	10	10	10
Bran	20	20	20
Dried Buttermilk ..	5	—	—
Meatmeal	10	10	5
Salt	½	½	½
Mineral Mixture ..	+	—	—
Greenfeed	+	+	+
Fish oil supplement ..	+	+	+
Analysis.			
Protein (N x 6·25) ..	16·4	15·4	13·0
Fat	5·8	5·2	4·4
Crude Fibre	3·2	4·0	3·4

The average weights of the chickens remaining at 14 weeks were as shown in Table 2.

TABLE 2.

	Weights in Ounces of Chickens Remaining at 14 Weeks of Age.				
	Good Ration.	Ordinary.	Ordinary + B12.	Poor.	Average.
Alone	50·7	43·7	46·1	36·4	44·1
With penicillin ..	51·8	46·9	49·2	37·1	46·1
Average ..	51·3	45·3	47·6	36·7	..

Difference required for significance, with and without penicillin—

1 per cent. level = 1·6.

Difference required for significance between four different rations—

5 per cent. level = 2·3.
1 per cent. level = 3·2.

Difference required for significance within table—

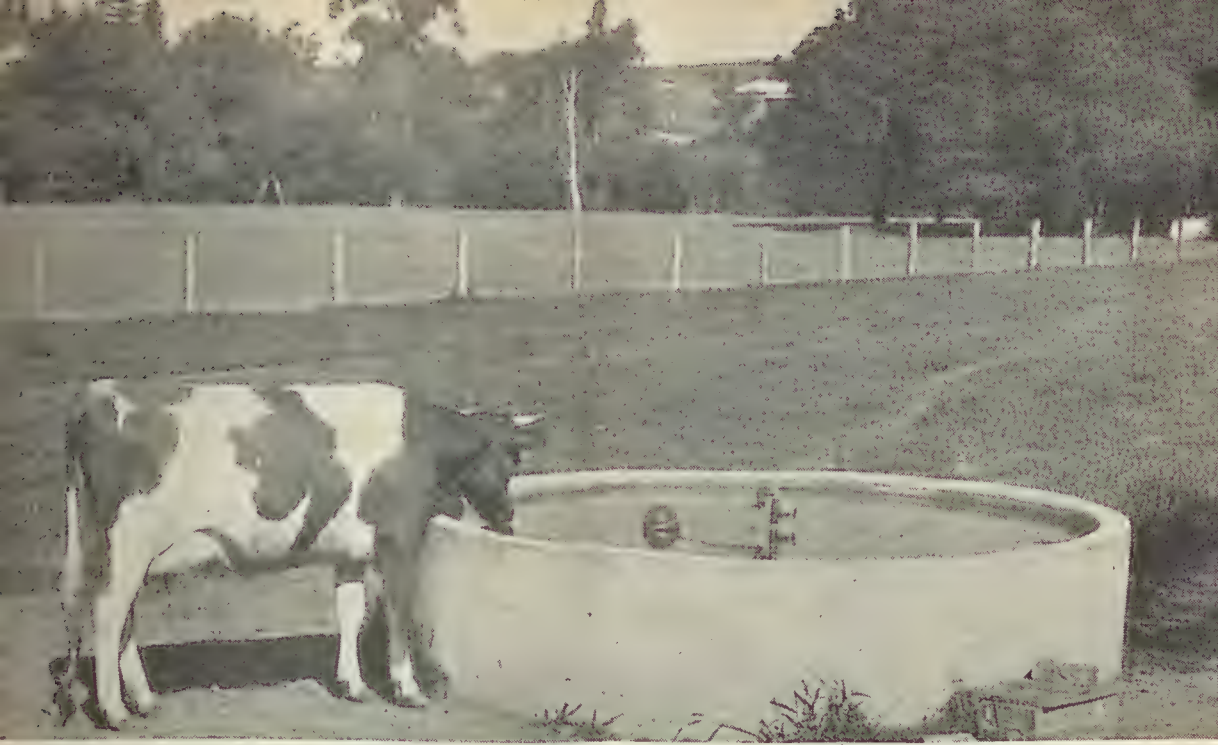
5 per cent. level = 4·6.
1 per cent. level = 6·3.

Because of pressure on available accommodation, the number of chickens in the groups had to be reduced to 50 per group in the latter part of the experiment. This was done using a system of random numbers in order not to bias the results. Due to the earlier outbreak of rickets, many chickens had a severe check and some were permanently stunted, but were not culled for the same reason. These runts are probably responsible for the overall poor growth and feed efficiency. Feed efficiency and mortality are shown in Table 3.

TABLE 3.—FEED EFFICIENCY AND MORTALITY.

Ration Fed.	Feed Efficiency (lb. Consumed per lb. Gain).	Percentage Mortality.
Good	5·08	22
Good + penicillin	4·76	14
Ordinary	5·36	30
Ordinary + penicillin ..	4·72	25
Ordinary + Vitamin B12 ..	4·83	25
Ordinary + Vitamin B12 + penicillin	4·61	15
Low protein..	6·45	52
Low protein + penicillin ..	5·56	40

As stated earlier, the mortality rate in this experiment was particularly high due to rickets which was caused by feeding a fish oil emulsion later found to be stale. This accident has supplied some further information on the type of results that could occur in the field and emphasizes that the better the ration the better the results in growth rate, feed efficiency and viability of similar lots of chickens.



Stock are well provided with clean, readily-accessible water at "Killara", Woori Yallock.

The Dairy Farm

Water Supply on Dairy Farms

DURING the past few years the principal dairying areas of Victoria have had rainfall many inches above the average, but in the first half of this year most districts received much less rain than usual. Many farmers who, in January, estimated that they had ample water stored for their summer and autumn needs, could not foresee that the weather would continue to be very dry until the end of May. On farms where there was neither a permanent water supply nor adequate storage facilities there has been much loss of milk production, and quality of milk and cream has been impaired. There has also been the heavy and costly work of bringing water from elsewhere while awaiting the rains needed to replenish tanks and other farm storages.

Those who were short of water not long ago should act promptly to improve their catchments and enlarge their storages. Spoutings and tanks on farm buildings should be cleaned out and repaired. Contour drains leading to dams and reservoirs should be cleared of all obstructions so that surface water will not be lost but will reach these storages. Many catchment areas could be enlarged by extending these drains. Where water shortage has occurred it would be wise to consider both this possibility and that of enlarging the storage itself.

An ample and clean water supply both for stock and for dairy purposes will pay dividends and prevent loss of production and falling off of quality. In view of the low rainfall which most districts have had to date, apparent faults should be remedied promptly so that storages can be amply replenished by the good falls of rain which can be expected during the next few months. The success of a dairy farm is greatly dependent upon the provision of a good clean water supply which is ample at all seasons.

[A. HOLMES.]

Seasonal Changes in Milk Tests

At this time of the year dairymen can expect to see changes in the fat test of milk from their herds and also variations in their cream tests, as many cows have calved in recent weeks.

Just before cows dry off, tests of milk are high although the volume produced is low, but when the cows come in, in late winter or early spring, the volume increases and the fat test diminishes. The fat test of milk is at its lowest point about two months after

calving, so that milk from a number of cows in the early stages of lactation can have an appreciable effect on the composition of the herd milk.

Cold weather also can affect the fat test of milk. A sudden drop in temperature tends to increase the fat test, but diminishes the quantity of milk.

On farms where cream is produced, such changes in the fat test in milk will produce changes in the cream test, since the composition of the milk is one of the factors governing the cream test. Other things being equal, the richer the milk, the richer the cream. [O. St. J. Kent.]

Low Solids-Not-Fat in Milk

The bulk milk, as drawn from a herd of cows, will usually contain more non-fatty solids than the 8·5 per cent. minimum required by law. But not all milk which fails to reach this standard has been diluted. Milk drawn from individual cows will sometimes have a lower solids-not-fat content, and this can also be true of the bulk milk from a herd.

The difference between milk naturally lacking in these solids and that which has been diluted with water can be detected by the freezing point test. It is an offence to sell milk which is deficient in solids-not-fat either through dilution or from natural causes.

The causes of this lowering of the solids-not-fat are not fully known; nor are the seasonal influences which seem to increase this problem at certain times of the year. Some experiments in Australia and overseas, however, have shown that the feeding of the herd has a bearing on the problem, and to this extent some farmers may be able to help themselves to overcome it.

Condition of the cow at calving has a bearing on the problem; therefore, as a long range solution, herd owners might well see that their cows receive adequate feed during the period when they are dry. Of course, it is equally important to see that they do not lose condition unduly during the lactation.

Then, assuming that the amount of feed is adequate, attention should be given to the correct balancing of the ration, especially when cows are milked at seasons when the paddock feed is least suitable for milk production. A lack of protein when pastures have dried off or when they are short in winter may lower the content of casein and other proteins in the milk. A ration lacking in protein could be corrected by the grazing of a green crop, by inclusion of good quality lucerne or clover hay or—more expensively—by the use of a high protein concentrate such as meat meal.

When compounding a supplementary ration the farmer should also give thought to the amount of "dry matter" (that is, all substances other than water) taken in by the cow each day. A large ration of palatable concentrates, too high in "dry matter" can lower the solids-not-fat in the milk. [K. M. Sillcock.]

Short Season Milkers

This term was used in a recent discussion among dairy farmers not to denote cows which dry off after a short lactation but to describe those people who cause many cows to do so by handling them in a faulty manner. The belief was expressed that, while some cows are capable of milking on persistently under almost any treatment, the real test of the operator's skill is the cow—and there are probably many of them—which will milk through a full lactation when suitably treated but will dry off early if upset from time to time.

Those who think of culling such cows from their herds might well give this some thought. Could the fault be in their own temperaments, rather than in the nature of the cows? A milker who is kindly disposed toward his animals and would not tolerate cruelty might yet be in too much of a hurry to get the best out of them, or he might be handling too big a herd.

There is, of course, also the possibility that the "short season milker" might be not the person doing the milking but the machine. This too, should not be overlooked by the farmer who is asking, "Is there a short season milker on my farm to account for those short season cows?"

[K. M. Sillcock.]

The Young Farmer

Dairy farmers, like cricketers, are rarely genuine "all-rounders". They tend to be better at one part of their work than at another, even if they cannot be said to be unskilled or neglectful in any part of it. This was noticed repeatedly in the course of

(continued on page 414.)

Garden Notes for October

By GEORGE HYAM, Horticultural Supervisor

THE FLOWER GARDEN

Displaying Annuals More Effectively

THE planting in formal array of straight lines of the different species of annuals or the still more formal "carpet bedding" of the Victorian era is being largely discarded overseas, and to some extent here, in favour of an informal layout of many more species or varieties, and this latter method has several advantages.

The change is probably due primarily to the need to save labour and the necessary work in preserving the symmetry of any kind of formal bedding, involving as it does, the prompt replacement of any failures with spare plants brought to an advanced stage in containers, the constant trimming of faded flowers to keep up a succession of blooms and the raising of successions of plants to avoid lengthy periods of bareness in the beds. Few can now afford the services of permanent gardeners or even casual garden labour, and the general trend, therefore, in all garden layout is to reduce the work involved to a minimum, and modern garden design has achieved this to a large extent.

Our average gardens are smaller than they used to be and, for effect, massed beds of a single species of annual are only suitable where space permits several such beds to be made. The straight line method of bedding permits only three or four annuals of different height to be grown in usual narrow borders or small island beds of the average modern garden, and this greatly restricts the number of species that can be grown to the exclusion of many of the less common but quite desirable kinds. The informal method of planting allows many more species to be grown and there are unlimited possibilities of variation in colours of the flowers and the form or tints of their foliage. It also allows a more extended flowering period and a better continuity of floral display without the necessity of completely colourless beds between seasons which is inevitable when only a few species of annuals are grown.

Informal planting allows more direct sowing in the beds and this is a cheaper and less laborious work than relying on purchased seedlings or even raising seedlings onesself.

Informal Bedding of Annuals

The procedure is practically the same as the construction and planting of an herbaceous perennial border. It is best to first make a rough plan on paper and after deciding how many species or colour varieties you wish to plant, irregular sections are marked off on the plan so that it resembles a jig-saw puzzle. Mark the plan with the kinds to be grown in each section. On a bed planted in this way measuring 20 feet by 5 feet, 24 kinds of flowers can be grown including the small ones planted as edging plants. It is, of course, not necessary to plant so many and they can be duplicated or different colours of the same species can be used. In designing informal beds, colour combinations should be the main principle.

There is no special method of soil preparation, but sufficient compost or other organic matter should be worked in to provide for three of four plantings without further addition other than perhaps a top mulching during the summer. After the surface is raked over, mark out full-sized areas similar in shape and proportion to those on the plan. Place a numbered wooden plant label in each so that you can sow according to plan in regard to species. There is an abundance of choice for any season in the year,

as a good seed catalogue will show, and for spring and summer planting at least, there are very few which cannot be sown direct. First sow the rear patches and continue to the front.

Sow broadcast as thinly as possible over each section, mixing small seeds with sand or wood ash to get an even spread. Press the seeds into the soil and cover with not more than ½ inch of fine soil. Thereafter, the bed will need as frequent watering as that given a seed bed, which is daily until they germinate, gradually increasing the intervals between waterings as they get larger. Thinning should be done progressively. Commence by thinning those in the two-leaved stage to about 2 inches apart, finally spacing the plants according to species. The best average distance is 9 to 12 inches so that the plants will suppress weeds as they mature.

The labour of thinning and weeding is reduced to a minimum by the use of a single-tined hand cultivator. This consists of a single-pointed blade bent at a right angle to the handle. The sides of the tine have a cutting edge so that the tool can be used horizontally as a chipping hoe and the point can be used vertically for the purpose of cultivating between closely-spaced plants. This type of cultivator avoids all stooping and bending and the handle is long enough to reach for a distance of about 8 feet. If thinning or weeding has to be done by hand pulling, the beds should not exceed 5 feet in width whether planted in rows or informally. Close-planted beds should never be stood or kneeled upon. This point is often overlooked.

Shrubs for Training on Fences or Walls

The present trend towards growing fruit trees on fences or walls as espaliers seems to have stimulated an interest in training shrubs in the same way. In some respects, and in certain situations, this method is preferable to planting the true climbing shrubs which are apt to get too rampant, although they still have their uses in covering large areas. Espaliered shrubs seem to be more suitable for decorating the walls of a house particularly if such walls have to be painted from time to time. They are also more suitable than bush-shaped shrubs where the marginal beds adjacent to the house or buildings are very narrow and where ordinary shrubs would lose their natural symmetry owing to being too close to such walls.

The best and easiest type of shrubs for training are those which produce long straight stems like those of fruit trees although some of the more irregular growing kinds can be trained to a flat surface, but only with much more frequent manipulation.

Some typical subjects which can be trained quite easily are the Buddleas, Lantanas, and the Evergreen hibiscus, all of which are very suitable and do best in sunny situations. Others which can be grown anywhere where they will get a reasonable amount of sun are the *Ceanothus Gloire de Versailles*; *Clianthus punicens*, the N.Z. Glory Pea with flowers the same red colour and shape as Sturt's Desert Pea, but without the purple centre; Cotoneasters, and in particular, *C. horizontalis* and *C. salicifolia*, have a natural spreading habit and are simple to espalier. *Habrothamnus* is more effective when trained than as a bush. *Plumbago capensis* is another which is better trained. For southern shady sides, tall-growing fuchsia varieties, especially *Gracilis*, will flower throughout the spring and summer and the *Cydonia japonica* trains well and flowers in shade. *Evonymous japonica*—the evergreen species—will also tolerate shade and produce good berries there.

It is best to provide a lath trellis fixed in front of a wall and some inches away from it. This should be constructed so that each square measures about 12 inches, which makes training much easier than larger or smaller sections. It is as well to fix it so that the whole trellis with the plant still attached can be pulled away from the wall sufficiently to allow any painting to be done. If the wall is brick, see that the trellis allows air circulation at the back to prevent any scorching if in a north or westerly aspect.

The method of training is on the same principle as for fruit trees, i.e., that in the early stages, this should be done throughout the growing season by tying the main shoots as they lengthen in a position where they should grow, and at the same time, suppressing any unwanted or misplaced shoots as soon as they are formed. Normal pruning is done at the usual time for the species, which for most, is immediately after flowering finishes. Those which flower on new laterals should have these shortened well back to produce more flowering wood for the following season.

Melons in Southern Victoria

Most home gardeners who have attempted to grow the delectable rock melons in districts south of the Divide have usually been disappointed in regard to yield or the size of the fruits and this applies to some, though a lesser extent to water and citron jam melons.

The commercial production of melons is now mainly confined to the northern irrigation districts but with a little extra care and knowledge of the plants, the few melons required for household needs can be grown in the south under home garden conditions, except perhaps, in the cooler highland areas.

Melons of all kinds are essentially warm-weather plants and to flourish at any stage, they need higher air and soil temperatures than other cucubits such as marrows, cucumbers, pumpkins or squash but as for these allied species, there is some slight variation in the requirements of different species in regard to this. Marrows and the summer varieties of pumpkins can be planted earlier and will fruit earlier than the later maturing long storage pumpkin and squash. The early kinds of these species can be sown from mid-October onwards; the later kinds early in November but for outdoor sowing, the soil temperature in southern Victoria is rarely high enough for the normal growth for melons before the latter end of November. Thereafter, the normal weather conditions are quite suitable for their growth but as most varieties take 100 days from seed to maturity, and another 30 days for full cropping, if sowing is delayed until this favorable period for sowing in the open, the lower temperatures of late March usually result in a curtailed bearing period or undersized fruits.

However, the home gardener can have his plants into production earlier—with most, in February, by the simple expedient of first sowing the seeds in pots or tins in September and keeping these under a frame or even on a window-sill so that the temperature is above that of open conditions, particularly at night. In the case of melons, it is best to sow four or five seeds to each container and to cull them out to a single plant to grow on—still under some shelter—until well into October, for planting out in mid-November. This should ensure that the first flowers appear in late December which is the stage melons should reach in order to produce a full season's crop.

Melon seeds usually have a rather low percentage of germination, hence the necessity for planting more than one seed to the container so as to ensure at least one good plant. Jam-tins or 3 or 4 inch pots are the best form of container as the roots of melons are very delicate and when planting, the seedling should be very carefully tipped out with the ball of earth round the roots intact. Consequently the box-grown seedlings which are sometimes offered rarely establish themselves properly.

The second point about growing melons, which applies wherever they are grown, is the necessity for a high organic content in the soil around and under them—a desirable factor in growing any curcubit but especially for melons. They are best planted on low hills which have had about half a bucketful of compost or rotted animal manure placed under them with 4 or 5 inches of soil on top.

Melons also need more nitrogen than other curcubits and in addition to an ounce of a complete fertilizer spread round each plant after planting, a sulphate of ammonia solution (1 oz. per gallon) should be watered round the plants every fortnight after the first flowers have set.

Plant them not less than 4 feet apart though two plants can be grown to a hill if desired. In the south, melons should always be planted in the open. In shade, they will inevitably suffer from mildew or rust. These can be controlled on plants in the open by half-strength bordeaux (2 : 2 : 40) but as melons can be affected by strong copper sprays, growers usually favour copper-oxychloride dusts. Rock melons may also be damaged by sulphur and D.D.T. Arsenate of lead is best to control any chewing insects attacking melons, and nicotine or the lindane form of B.H.C. for aphids. Red spider affects melons and if this does occur, nicotine is safer to use than the lime-sulphur sprays used for this pest on beans.

Melons produce separate male and female flowers and as for pumpkins and marrows, hand-pollination, which has been previously described in these notes and in the Department's bulletin "Vegetable Growing", is good practice under home garden conditions, particularly in suburban gardens where bees are scarce.

Species and Varieties of Melons for Home Gardens

The so-called "Rock" melons which are more correctly described as "Musk-melons" are usually preferred by home gardeners and this group includes the canteloupes. Some varieties are difficult to distinguish as being rock melons or canteloupes, thus causing a good deal of confusion in terms. The true cantaloupe varieties which have rather warty rinds do not seem to be listed here now by seedsmen as dollar restrictions have made it difficult to import the seed. For southern districts, Hale's Best No. 45 which has a high degree of resistance to mildew is probably the best rock melon to grow and Early Hackensack, which matures in less than 100 days from seed will also do well in the south if the plants are raised early for transplanting.

The economy of growing water-melons in small home gardens is doubtful on account of the space needed but Hawkesbury Wilt Resistant or Keckley's Sweet which mature in a shorter time than most others are the most suitable. Raisers in the U.S.A. have developed a strain of water-melons suitable for the short growing season of their northern States. One variety, "New Hampshire Midget" is said to mature in 65 days but the seed is not yet available from local seedsmen. These are also known as "Ice-box" melons on account of their small but prolific fruits. One local strain known as Somner's Early is said to mature in 75 days. Any short season melon is more likely to produce satisfactory crops in the south of this State.

As one citron melon is usually quite sufficient to make all the melon jam a household needs, it is hardly worthwhile to devote a space equal to 6 ft. x 6 ft. for each plant in small home gardens but where it is desired to do so, the Red-Seeded Citron is the best variety.

Perhaps the surest croppers in the south are the long-keeping winter Cassaba or Honey Dew melons. They mature late, more or less in one flush, but their fruits will store until well into the winter.

In districts north of the Divide, any variety can be relied upon to crop from seed sown in the open in October or early November on account of the earlier and warmer conditions necessary for melons.

THE YOUNG FARMER—(*continued from page 410*)

judging the Dairy Farm Management Competition, and was true even of those who won the main awards.

Why is the farmer who is strong in pasture management and fodder conservation sometimes weak in breeding and herd management? Why is the keen and successful breeder sometimes not oustanding in his milking methods and his general routine in the dairy?

Perhaps farmers have inherent ability which is stronger in some directions than others, but probably much of this lack of balance in dairy farm management skills is due not so much to special abilities as to special interests. The successful breeder may be so because he is happy with animals and interested in spending much time over them. The man whose success lies in pasture management, on the other hand, may be impatient with what he regards as "fiddling" tasks with stock or about the dairy. His delight is to embark on a task in which he can continue throughout the day, and therefore paddock work appeals to him most of all.

Then there is the "handyman" type of dairy farmer, who has a knack of devising handy labour-saving gadgets and who finds it easy to keep all his buildings and equipment in first class order.

It may be illuminating to take stock of your own methods, or of those of a farmer well known to you.

Which is your favorite type of work, in which you feel most happy and at ease? Is it in this work that your farm management reaches its highest peak? And what is the task which bores you most? Do you find that you have a tendency to overlook its true importance? Do you fail in record keeping? Do you hurry milking or calf feeding unduly? Is it an effort to plan a breeding programme? and so on. Try to improve on your weaknesses, and the tasks you once disliked will become more interesting.

[K. M. SILLCOCK.]

LIVE STOCK NOTES

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

New Hereford herd sire for Dookie College, Kildrummie Sangret.

NEW POLL HEREFORD SIRE AT DOOKIE

A NEW herd sire, Kildrummie Sangret, has been purchased from D. and W. Carnegie, of Holbrook, N.S.W., to head the Poll Hereford Stud at the Dookie Agricultural College. Kildrummie Sangret is the first son of Milton Sanak 4th to be sold from the Kildrummie stud and was one of a team of seven splendid bulls, all by Milton Sanak 4th which were being prepared for the next Sydney Royal Show.

Kildrummie Sangret was selected after an extensive search by officers of the Department of Agriculture for a new sire for Dookie. He is a very well grown, well developed youngster, now just 12 months old, carrying ideal Hereford markings, outstanding type and plenty of flesh where it is required.

Its pedigree shows how this bull is descended from some of the best Poll Herefords imported into this country.

His sire, Milton Sanak 4th, was purchased for 3,500 guineas by Messrs. Carnegie, after winning the reserve championship at Sydney in 1951. Other champions by Trumode Domino 16th include Milton Warragamba 4th, champion in Perth 1951 and 1952, Milton Rebel 3rd, champion in Adelaide 1951 and 1952, and the following females—Milton Rose 3rd, Milton Lucien 2nd, and Milton Flight 4th.

Plato Domino 36th was reserve grand champion at the American Poll Hereford Show in 1941. Milton Priscilla was junior and senior champion in Sydney in 1940.

On his dam's side, the breeding behind Kildrummie Sangret is just as good, although perhaps not quite so spectacular. His maternal great grandsire, Pawnee Rollo 58th was champion in Sydney in 1938 and, at nearly 19 years old, still looks well in the Moreduval stud of Mr. R. Simson, Quirindi, Queensland. His sire, Pawnee Rollo 10th was a National Champion in U.S.A.

The Dookie Poll Hereford stud was founded in 1938 with the purchase of Royal Gem 23rd (imp. N.Z.) from Mrs. H. M. Kilpatrick,

Kildrummie Sangret	Milton Sanak 4th	Trumode Domino 16th (Imp., U.S.A.)	by	Plato Domino 36th
		Milton Priscilla	by	Milton Domino 48th (Imp., U.S.A.)
	Moreduval Egrette	Park Tahurangi (Imp., N.Z.)	by	Gem Domino 2nd (Imp. U.S.A.)
		Moreduval Paula 3rd	by	Pawnee Rollo 58th (Imp., U.S.A.)

Deniliquin, N.S.W. This bull was mated to the Hereford cows which had been bred at the College since its inception in October, 1886. Prior to that, Hereford cattle had been bred at the Government Experiment Farm which had occupied the Dookie Agricultural College site since 11th October, 1875, and the first bull to be purchased was Challenger, obtained from Mr. H. Beattie, Mt. Aitken, Gisborne.

The original Dookie Hereford cows were obtained from Mr. J. A. Beattie, Gisborne Park, Gisborne, and over the years, sires from many of the leading studs such as Golf Hill, Treverder, Coliban, and Hobartville had been used.

Following the change to Poll Herefords with the use of Royal Gem 23rd, the herd sires purchased have been Cudgeena Beauworth 55th from Mr. L. R. Leake, then of Cudgewa but now of Howlong, N.S.W., Moreduval Darby from Mr. G. G. Howell, Wollert and Cudgeena Gamin 11th, also from Mr. Leake.

Kildrummie Sangret will be used mainly on the progeny of Moreduval Darby and Cudgeena Gamin 11th, although a number of cows by Cudgeena Beauworth 55th are still breeding regularly in the Dookie stud where over 40 breeders are kept.

[A.C.T.H.]

INTERESTS FOR PIG RAISERS AT THE MELBOURNE ROYAL SHOW

Pig raisers visiting the Melbourne Royal Show will find much to interest them.

Trap door for collecting eggs from community-type nest.

There will be a good representation of Large White, Middle White, Berkshire, Tamworth, Large Black, and Wessex Saddleback breeds in the stud classes. They will all be judged on Thursday, 17th September.

Wherever practicable the stud pigs will be paraded in judging rings adjoining the pig pavilion, so that spectators as well as the judges can obtain a good view of the pigs. The awards are to be written on black boards near the judging rings as soon as they are known.

The classes for pork and bacon pigs which include both pure-bred and cross-bred pigs, the progeny of pure-bred parents, are of special interest. In these classes an entry consists of two pigs of the same litter and of reasonably close weights. One pig of each entry is to be taken from the showground and slaughtered on Wednesday 16th September. The carcasses will be judged according to their shape, meatiness, and fatness.

The cut carcasses will be exhibited in the refrigerator case in the Government Pavilion on the showground from Friday afternoon the 18th. On the side and loin cut of each carcass will be a score card showing the breeding, age, weight, measurements, and the marks awarded for all features of the carcass. Duplicates of the score cards will be placed over the pens in which the live pigs are kept for the duration of the show.

Auction sales of stud pigs at the show pens will be held on Tuesday, 22nd September, for Large Whites and Middle Whites, and on Wednesday 23rd for Large Blacks, Tamworths, Berkshires, and Wessex Saddlebacks in that order and commencing at 10 a.m. each day.

Officers of the Department of Agriculture will be in attendance throughout the show at the Government pavilion and at the pig section, to give advice on pig production to people seeking such information.

[L. A. Downey, H.D.A., Pig Expert.]

IMPROVING EGG QUALITY

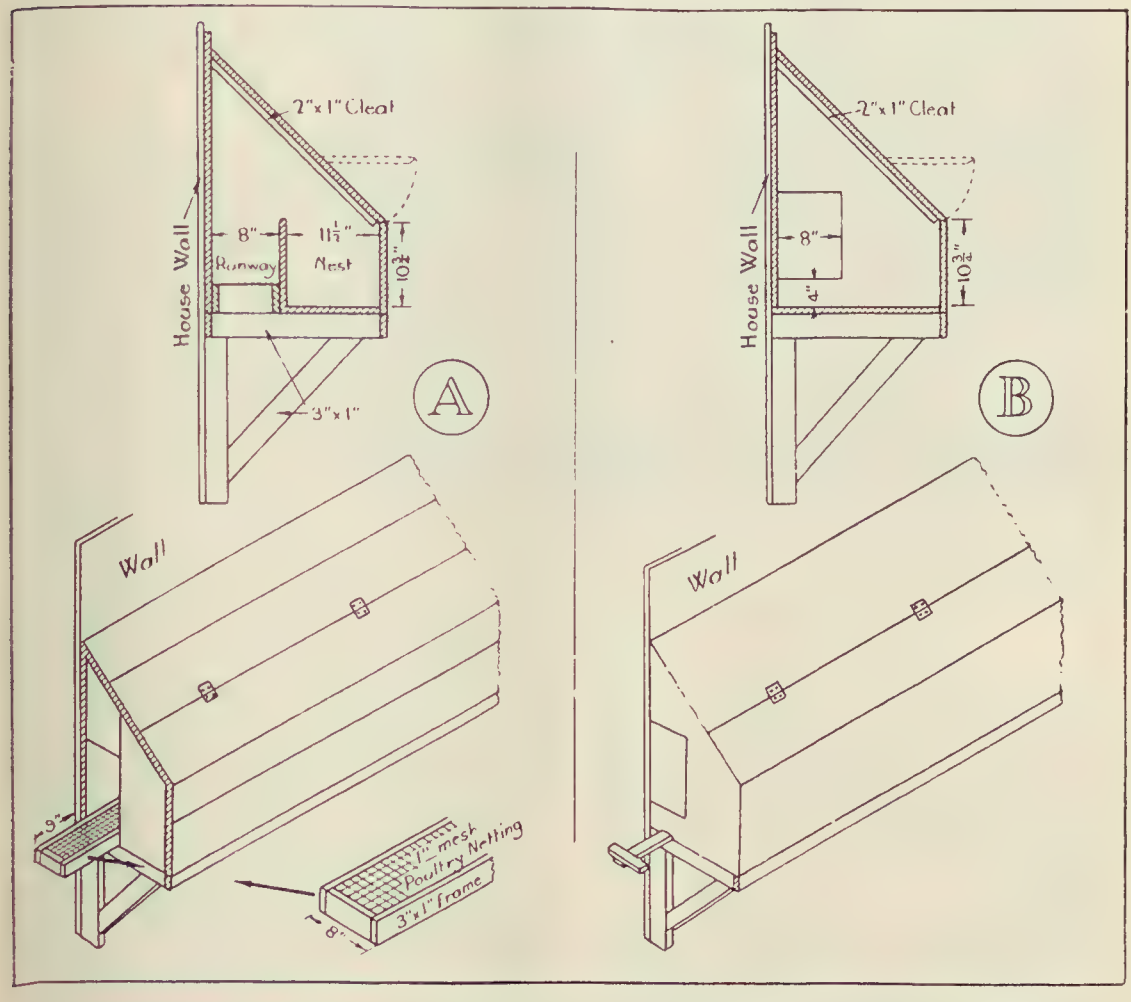
Egg production is the poultry farmer's principal source of income. The extent of his income is dependent upon the number and quality of the eggs laid, and many factors are involved in achieving this objective.

Breeding and feeding have an important bearing on the number and quality of eggs laid, and the cleanliness of and cracks in the shell are influenced by the system of nesting and the state of the litter in the pens.

Nesting has always been a problem, and various designs have been used, but the industry still prefers the simple, inexpensive types, and these are satisfactory provided they are kept in good order.

The function of a nest is to provide birds with seclusion and comfort while laying, and is a most important accessory on the farm. Poultry farmers would be well advised to service their nests regularly in order to reduce the number of cracked and soiled eggs, which are far too common on commercial poultry farms. Cracked and broken eggs are a complete loss, and soiling lowers their value considerably. Frequent collection reduces wastage and enables poultry farmers to submit large quantities of clean, unwashed eggs, which are essential for export.

In view of the rising costs of foodstuffs, poultry farmers can ill afford to ignore an important factor such as nesting as it takes the average commercial poultry farm approximately 8 oz. of food to produce an egg, and on large farms as much as 12 oz. per egg, and it is a waste to have eggs spoiled by careless nesting.



Community-type poultry nests. In type (A) the nests are entered from the passageway indicated. A similar design without the passageway is shown in (B).

Carelessness in Egg Collection is Costly

It is not uncommon to see eggs left on the floor overnight, and frequently in the vicinity of the perches, and I feel quite sure that if the value of each egg in coin was placed on the floor, it would be necessary to lock the pen door to stop the poultry farmer from collecting the coins immediately.

Eggs are apt to become commonplace on farms where they are produced daily in large numbers and the owner frequently loses sight of the value of a single egg, which in itself is a valuable commodity and is an essential factor in the daily total.

Soiled eggs require washing and this entails a considerable amount of extra labour. If the stain remains after washing, the eggs are down graded in value, which represents a considerable financial loss annually, and is also a source of worry on egg packing floors.

Recent prices of eggs and chickens should be sufficient incentive to producers to preserve every egg in perfect condition.

Most of the trouble occurs on what might be termed intermediate-sized farms, where the owner is unable to employ labour, is fully engaged in routine work, and has very little time left for general maintenance and supervision. It would be better to reduce the size of the flock to allow more time for egg collection and other essential details, such as servicing of nests. The reduction in the size of a one-man flock where the maximum number of birds are kept, should allow time for more frequent collection of eggs, which would result in higher returns by eliminating stained and broken eggs and by preserving quality.

[M. D. HALL, Poultry Expert.]

RACES OF BEES

There are some twenty known varieties of the honey bee (*Apis mellifica*) but five only have been introduced and established in Australia, namely, the Black Bee; the Italian; the Cyprian; the Carniolan; and the Caucasian.

The Black Bee

The Black Bee is said to have been brought to Australia from Great Britain in 1822. Since then the variety has spread over almost the whole of Australia. It is a hardy bee and will fly on cold and wet days when some of the other races of bees will not leave the hive, and it commences brood rearing early in spring—almost in mid-winter. This is a most important factor in the fertilization of the blossoms of the earliest flowering kinds of fruit trees. In cool districts, or when the pollination of fruit blossoms is of greater importance than the yield of honey, the black bee or one of its crosses with Italian or Carniolan is probably the best kind to keep.

On the other hand, Blacks, although commencing to breed early, do not maintain a high rate of reproduction for long and, where the main honey-flow occurs in summer, do not give as good a yield of honey per hive as the Italian. They are excessive swarmers, more excitable when handled than the other races, offer less resistance to foulbrood, and often allow wax moth grubs to infest their combs.

Italian Bee

The Italian bee is of somewhat lighter build than the Black and has three yellow or light orange coloured bands across the abdomen. It is gentle and little inclined to sting when properly handled. Italian queens, even those imported direct from Italy, vary greatly in colour, some are quite yellow, and some almost as dark as black queens; while others have dark and yellow bands. The colour of the queen is therefore no indication of purity of race, which is best indicated by the uniform markings of all her worker progeny.

Italian bees cling tightly to the comb when the frames of comb are handled, while Black bees or hybrids often drop off without shaking. Pure-bred Italians, and, to a lesser degree their crosses with others, are more immune from foulbrood, and rarely allow wax moth grubs to get into their combs. They begin breeding later in spring than Blacks, but at the approach of warm weather soon overtake the latter and maintain a greater worker force throughout the season.

A variation of the Italian is the Golden Italian which was secured by select breeding for colour, or by crossing with Cyprians. It has five yellow bands instead of three—practically the whole of the abdomen is yellow. Bees of this variety are more susceptible to cold and wet than the three-banded Italians and rather predisposed to bee-paralysis. Italians, when pure, do not

cap their combs so white as Black bees do, and are therefore less suitable for the production of comb honey.

Cyprian

In appearance, and many other respects, the Cyprian bee resembles the Italian. It is somewhat slimmer, the yellow rings are of a deeper shade, and the fuzz rings of the segments whiter. Cyprians are good breeders, sometimes continuing brood rearing when a honey-flow has stopped until all stores are consumed. They raise a large number of excellent queen cells at swarming time or when made queenless. Their undesirable characteristic is viciousness during a dearth of nectar, when even the use of smoke, so effective with other races of bees, will not subdue them. As they are not superior to Italians in honey gathering, they are not a desirable bee to keep, and at present are not known to exist in Victoria.

A beekeeper spotting for budding and bloom.

Carniolan

In appearance and habits the Carniolan bears much more resemblance to the Black bee than either of the preceding varieties. It is of a black colouring with silver-grey bands of hair on the abdominal segments. The cross Carniolan x Black is in appearance almost indistinguishable from the pure Carniolan and renders it somewhat difficult to be sure of the purity of the bees, but when handled, the temperament of the Black will show up quite distinctly, the main distinctive feature being the extreme gentleness and the quietness of the pure Carniolan on the combs while being handled.

The Carniolans are reputed to be excessive swarmers and, while in isolated cases in Victoria they have lived up to that reputation, they have also proved their honey-gathering ability, although most apiarists still prefer to use the well-tried three-banded Italians.

The Caucasian

The Caucasian bee was introduced to Victoria shortly before the second World War. Two varieties of this bee are in existence; the Mountain Grey of the high altitudes in Abhasia, and another from the south-eastern Transcaucasus, which has yellow or orange parts on two abdominal segments. It is inclined to be savage and stings freely.

The Mountain Grey is gentle and industrious, hardy, and a moderate swarmer. In some respects it resembles the Carniolan. It is a good honey gatherer, and is adapted for use in settled areas on account of its gentleness.

TOBACCO EXPERIMENTS

Varietal Tests at Nathalia

By F. L. FRENCH, B.Agr.Sc., Agricultural Research Officer

Seed of a number of flue-cured tobacco varieties was introduced in 1948 from the United States of America and Canada. Six of these, together with Hickory Pryor—the standard Victorian variety—were selected for testing at Nathalia. In the following article, the performance of these varieties is outlined for three seasons from 1949 to 1952, and the superiority of Virginia Gold, Yellow Special, and Delcrest is demonstrated. Virginia Gold is recommended for main plantings in the Murray Valley.

An excellent tobacco crop of "401" variety.

DURING a tour of tobacco producing areas in the United States of America and Canada in 1946, Mr. W. J. B. McDonald, Senior Plant Investigation Officer of the Department of Agriculture, obtained seed of a number of flue-cured tobacco varieties for testing under Victorian conditions.

After preliminary trials at Myrtleford in 1948–49, several varieties were selected for the establishment of a variety trial at Nathalia in 1949–50. This trial was continued with slight modifications for three seasons.

Location

The work was carried out on the property of Messrs Smith Bros. at Nathalia, adjacent to the Broken Creek. The soil is a deep, fine sandy loam, typical of those soils which have been and are being used for the production of bright flue-cured tobacco in the Nathalia and Gunbower areas.

Monthly rainfall data for the growing seasons at Nathalia are shown in Table 1. The precipitation is fairly low and variable during the summer months, and consequently frequent irrigation is necessary.

Cultural

Transplanting of the seedlings is generally carried out during the first three weeks of December. Irrigation by overhead spray systems is used exclusively, and is applied immediately before planting and at approximately weekly intervals for most of the season.

Market Garden fertilizer or 5 : 1 : 1 mixture is applied at the rate of 5 cwt. per acre. Harvesting and curing commence at the end of February and continue until late April or early May.

Variety Trials

Except in 1949–50, seven varieties were included in these trials, namely :—

Variety.	Introduced from
401	U.S.A.
Delcrest	Canada
Silver Dollar	Canada
Virginia Gold	U.S.A.
Yellow Special	U.S.A.
Yellow Special A	U.S.A.
Hickory Pryor (standard Victorian variety)	..

Yellow Special A and Delcrest were first included in 1950–51.

Randomized blocks were used in each case, replicated four times. The plot size was two rows x 26 plants, spaced 3 ft. between the rows in 1949–50 and 3 ft. 9 in. thereafter to allow for the more vigorous growth of the introduced varieties.

Produce from each plot was weighed immediately after picking and kept identified throughout the curing and bulking operations. Subsequently the cured leaf from each plot was sorted into from 12 to 15 grades, and each grade weighed and appraised according to the current price schedule.

TABLE 1.—MONTHLY RAINFALL—NATHALIA.

—	1949–50.	1950–51.	1951–52.	Average 30 Years.
December ..	13	93	58	119
January ..	Nil	59	26	118
February ..	365	419	12	105
March	653	2	72	96
April	233	99	181	132
Total ..	1,264	672	349	570

The 1949–50 season began with rainfall well below average for the first six weeks, but thereafter overcast conditions with rain on ten days in the first three weeks of February produced rapid growth and an outbreak in the field of blue mould which was severe by district standards and persisted for the rest of the season. This caused some loss of yield and quality and was probably aggravated by the close row spacing adopted at that time. The 1950–51 season had a high February rainfall with a light attack of blue mould later. Some leaf damage was sustained throughout the season due to strong winds.

The season 1951–52 was drier than average for the most part. No field mould was observed at any time, but a good deal of leaf damage occurred as the result of persistent strong winds.

RESULTS

The results have been compiled on the basis that green weights are more acceptable as an index of yield than are cured weights, since unavoidable losses of cured leaf are experienced during the curing process and subsequent handlings. Yield figures are presented as estimated cured weights in lbs. per acre, using the conversion factor—

$$\frac{\text{cured weight}}{\text{green weight}} = 15{\cdot}6 \text{ per cent.}$$

—which is the mean figure found at Nathalia over the three seasons.

TABLE 2.—MEAN YIELDS OF CURED LEAF (LB. PER ACRE).

	1949–50.	1950–51.	1951–52.	Mean.
Virginia Gold ..	1,850	1,480	1,595	1,640
Yellow Special ..	1,475	1,790	1,550	1,605
Delcrest ..	..	1,370	1,535	1,460
401	1,405	1,455	1,370	1,410
Silver Dollar ..	1,410	1,225	1,245	1,295
Yellow Special A	..	1,290	1,200	1,255
Hickory Pryor ..	995	1,025	1,255	1,090
	1,415	1,375	1,395	..

Differences for significance (P = 0·05)—
(*a*) Variety means 260 lb. per acre;
(*b*) Varieties same season 270 lb. per acre.

Virginia Gold and Yellow Special are the outstanding varieties as far as yield is concerned. They are not, however, significantly better than Delcrest and 401 which form an intermediate group.

The mean value of the leaf, in pence per lb., is shown in Table 3, in which all figures have been calculated from the price schedule for the 1952 crop.

TABLE 3.—PRICE PER LB. (PENCE).

—	1949–50.	1950–51.	1951–52.	Mean.
Delcrest ..	..	110	113	107
Yellow Special ..	96	103	101	100
401	92	111	92	98
Virginia Gold ..	84	107	100	97
Yellow Special A	..	104	94	94
Silver Dollar ..	85	103	87	92
Hickory Pryor ..	61	87	91	80
	86	104	97	..

Differences for significance—
(*a*) Variety means 12d. per lb.;
(*b*) Varieties same season 11d. per lb.

Leaf from Hickory Pryor is of lower value than all other varieties. Delcrest is superior to Yellow Special A and Silver Dollar as well as to Hickory Pryor.

Leaf values were low in 1949–50 due to extensive mould damage, which gave a relatively high proportion of low grade trashy leaf in all varieties.

The gross returns (£ per acre) are presented in Table 4.

TABLE 4.—GROSS RETURNS—£ PER ACRE.

—	1949–50.	1950–51.	1951–52.	Mean.
Yellow Special ..	589	771	649	670
Virginia Gold ..	646	662	664	657
Delcrest ..	..	625	725	650
401	533	675	527	578
Silver Dollar ..	501	530	464	498
Yellow Special A	..	557	475	491
Hickory Pryor ..	250	368	471	363
	508	598	568	..

Differences for significance (P = 0·05)—
(*a*) Variety means £112 per acre;
(*b*) Varieties same season £118 per acre.

In the final result, all introduced varieties have been more profitable than Hickory Pryor. Yellow Special, Virginia Gold and Delcrest do not differ significantly. These are superior to Silver Dollar and Yellow Special A but not to 401, which occupies an intermediate position.

In each case seasonal conditions have influenced, to some extent, the varietal responses. Reasons for this will be pointed out in the following section.

The percentage of various grades represented in the cured leaf are shown in Table 5, on the following page. The figures are averages from the two seasons 1950–52.

Comments on the Varieties

Virginia Gold appears to be the heaviest yielding variety in current use, even though it is susceptible to cold weather, which causes loss of top leaf in some seasons. This occurred in 1950–51 and again in 1951–52; it is estimated that in the latter season 150 lb. per acre of cured leaf was lost for this reason.

The quality of the cured leaf is quite good, but marred to some extent by the production of a somewhat excessive amount of green and green cast grades when it is cured in association with other varieties.

Virginia Gold shows considerable resistance to damage by strong winds, which is surprising in view of the large size of the leaf (see Table 6). Both factors contribute to high yield.

It is suggested that in view of its susceptibility to cold weather, this variety should be confined as far as possible to early plantings.

Yellow Special fluctuates somewhat in its performance as regards both yield and quality. In 1949–50 a high average price was obtained, but the yield was lowered due to loss of leaf from blue mould in the field. In 1950–51 the yield was high, but quality rather lower than expected. The growth was rank by comparison, the leaf slow to mature, and the proportion of green and green cast grades higher than usual. Both yield and quality were reasonable in 1951–52. The variety seems to be susceptible to damage by strong winds. It may be useful for late plantings.

Delcrest—The outstanding feature of this variety is its excellent behaviour during curing. The tendency towards bright grades is very marked, and the color and quality of the cured leaf are exceptional. The yield was good in 1951–52, but fairly low in 1950–51, due to field mould in several plots which failed to make rapid early growth. The top leaf is rather narrow, and for this reason must often be classed into inferior grades. Delcrest shows a good degree of resistance to wind damage.

TABLE 5.—PERCENTAGES OF LEAF COMPLYING WITH STANDARD GRADES.

Grade.	Average Price for 1952 (pence/lb.).	Delcrest.	Virginia Gold.	Yellow Special.	401.	Hickory Pyror.	Silver Dollar.	Yellow Special A.
L1 and L2 ..	154	4	2	1	3	..	2	..
BM1	142	8	8	6	4	1	5	6
BM2	133	11	2	5	9	1	3	1
BM2 K	124	..	1	3	2	1	2	2
BM3	114	33	26	19	23	10	16	25
BM3 K	105	9	9	10	8	12	8	6
Total Bright ..	..	65	48	44	49	25	36	40
B1	110	3	1	..	1	1	1	1
B2	93	10	3	13	8	6	7	12
IB1	76	5	4	3	4	5	7	5
IB2 and IB3 ..	60	1	1	3	3	2	3	5
Total Inferior ..	..	19	9	19	16	14	18	23
M1	100	5	12	8	8	19	11	9
M1 K	91	..	1	2	1	7	4	4
M1 Z	81	1	3	2	3	10	1	1
M2	72	..	1	2	3	12	6	3
M3	49	..	1	1	..	6	1	2
Total Mahogany ..	..	6	18	15	15	54	23	19
Good quality green cast mainly BM3 ..	106	8	16	15	10	5	12	12
Low quality green ..	59	2	9	7	10	2	11	6
Total Green ..	..	10	25	22	20	7	23	18

TABLE 6.—MEASUREMENT DATA, 1951–52.

—	Number of Usable Leaves per Plant.	Length of Bottom Leaf (inches).	Width/Length Bottom Leaf.	Width/Length Top Leaf.	Number of Cured Leaves per lb.
Virginia Gold	25	26·0	0·65	0·53	43
Yellow Special	23	24·4	0·60	0·48	44
Delcrest	21	25·6	0·55	0·41	44
401	25	23·5	0·56	0·49	51
Yellow Special A	24	22·6	0·57	0·45	59
Silver Dollar	25	24·4	0·56	0·48	52
Hickory Pryor	23	22·8	0·50	0·39	53

401.—This variety did very poorly in 1951–52 compared with its good record in the preceding two seasons. Most of the loss of yield and quality was due to damage by wind. Sucker growth was profuse throughout the season.

401 maintains a high gross return because of the usually good quality of the leaf. Its yield potential is limited by its relatively small leaf size, and it is thought, that, by virtue of its vulnerability to strong wind, exposed during 1951–52, its utility in the Murray Valley may be restricted to later plantings. It may serve a more general role in other districts.

Hickory Pryor performed fairly well in 1951–52 but not in previous seasons. It appears to thrive under adverse conditions and is particularly resistant to wind damage. The color grades tend to be predominantly mahogany and the yield is generally low. A feature is the absence of green grades in the cured leaf.

Tobacco curing barns, North-eastern Victoria.

Yellow Special A.—The yield of this variety is generally low, due mainly to the small leaf size, and, while the color of the cured leaf is fairly bright, it has sustained a considerable amount of damage in both the seasons in which it has been grown.

Silver Dollar is the least adaptable of the varieties under test, and has been badly damaged by wind and other agencies. Sucker growth is often excessive.

Although it appears to be potentially a high-yielding variety and produces some excellent quality leaf, it is generally associated with a large proportion of broken and fragile leaf. It seems most likely that in the majority of seasons it will not succeed in the Murray Valley.

Conclusions

Using the criterion of gross monetary return per acre to discriminate between the varieties, Yellow Special, Virginia Gold, and Delcrest show most promise.

While production costs up to maturity can be assumed constant for all varieties, the handling costs per lb. of leaf at and after harvest will depend approximately on the number of cured leaves per lb., since leaves must be handled individually, to a large extent, during harvesting, curing, and grading.

Thus (referring to Table 6), the low number of cured leaves per lb. favours Yellow Special and Virginia Gold when production costs per acre are considered.

Delcrest differs from these varieties in that its high gross return is derived from the high value of its leaf rather than from high yield, and, when the weight of individual leaves is considered, it appears that Delcrest will have a correspondingly lower production cost per acre than either Virginia Gold or Yellow Special.

It is recommended that Virginia Gold should be used for main plantings in the Murray Valley. Late plantings should be comprised of either Yellow Special or 401, which, owing to their susceptibility to wind damage must not be planted early. Due to the straplike character of the top leaf, Delcrest may not be popular with growers, and, for the time being, large scale plantings are not recommended.

It is hoped that variations of the usual cultural practices can be evolved to give earlier maturity to both Virginia Gold and Yellow Special and improvement in leaf shape to Delcrest.

ACKNOWLEDGMENTS.

It is desired to thank Messrs. Smith Bros. of Nathalia for their helpful co-operation during the conduct of this work, and Mr. C. Vaughan of the Department of Agriculture for his appraisal of the cured leaf.

HORTICULTURAL NOTES

Contributed by Officers of the Horticultural Division

Jobs for September

For Black Spot Control—

Spray apples and pears at bud burst with Bordeaux strength 15 : 15 : 100.

Spray apples at pink bud stage with lime sulphur 2 : 100.

Spray pears, except Josephine and Winter Cole, at finger stage with Bordeaux 15 : 15 : 100. Josephine and Winter Cole may receive thiram 0·125 per cent. at finger stage.

For Brown Rot and Freckle—

Spray apricots at petal fall with thiram 0·125 per cent.

Thrips may be Controlled

APPLE growers will need to keep a close watch for possible build up of thrips infestation. Thrips can also cause damage to pears and berry fruits. The first sign of thrips can be seen in flowers of early blossoming trees and in capeweed flowers. If the number of thrips builds up to from 15–20 per blossom, they could be expected to seriously reduce the amount of fruit which will set.

Fortunately growers are now in a position to combat these insects, and either one of the insecticides, parathion or D.D.T., can be used effectively to kill the thrips.

D.D.T. should be used at a strength of ·05 per cent., and most brands may be used in combination with lime sulphur, but manufacturer's recommendation should be followed with regard to such a mixture. The emulsion types and "non-oil emulsion" which are available in various brands are suitable for use against thrips. Dispersible powders are not recommended as they have not proved as effective. Parathion (·01 per cent. active ingredient) may be used against thrips in combination with lime sulphur. Great care must be exercised in the use of this material because it is highly poisonous if the concentrated spray comes in contact with exposed skin or if the spray drift is inhaled.

These sprays are not likely to seriously affect hives of bees in the vicinity at the time of spraying. Bees have been known to work quite safely in fruit trees four hours after spraying with D.D.T.

Although lead arsenate is not used for thrips control, this spray may affect bees if applied to trees in blossom and where it is used for codling or light brown apple moth, it should not be applied until after petal fall.

Blossom Thinning Sprays

Experimental work is still in progress on the use of materials for spraying on trees to reduce the set of fruit and heavy blossoming. Until the effects of these sprays have been observed over a period of several years their widespread use cannot yet be recommended. However, the prospects for apple trees seem to be excellent this year and some growers may wish to try some of these sprays on a limited scale to reduce the crop to normal proportions.

The Yates variety in particular usually sets heavily and much laborious hand thinning is necessary to obtain fruit of marketable size. Chemical thinning by sprays during the blossom period offer possibilities of cutting costs of production with this variety.

The sprays should be applied mainly on the upper portions of the trees. Excessive thinning may occur if the whole tree is thoroughly sprayed. Because of this method of "partial" spraying, the inclusion of a fungicidal spray would not be efficient for black spot control. The materials suggested as being most effective are naphthalene acetic acid (N.A.A.) and Di-nitro cresol (D.N.C.). N.A.A. is used most commonly at a strength of 10 parts per million which is the same as that required when it is applied as a "stick-on" spray later in the

season, so that dilutions recommended on the container can be followed for blossom thinning, except where a weaker solution is required. D.N.C. emulsion may be used at a strength of 0·2 to 0·4 per cent. or 1½ to 3 pints per 100 gallons.

The following table gives concentrations and timing of these sprays for the common varieties.

YATES

N.A.A. 10 p.p.m. plus 1 pint white oil applied at late petal fall. D.N.C. 0·4 per cent. at late full bloom.

JONATHAN

N.A.A. 7·5 p.p.m. (¾ strength) plus white oil at late full bloom to petal fall.

STEWART'S SEEDLING

N.A.A. 10 p.p.m. plus white oil late full bloom to petal fall. D.N.C. 0·25 per cent. at or just after full bloom.

GRANNY SMITH

N.A.A. 10 p.p.m. plus white oil at late full bloom to petal fall. M.C.P.A. (Methoxone) 60 p.p.m. at late full bloom to petal fall.

Compare sizes of the apples on these two limbs of a Ballarat Stewart Seedling tree. Fruit on the lower limb has been thinned

ROME BEAUTY

N.A.A. 10 p.p.m. plus white oil late full bloom to petal fall. Methoxone 20 p.p.m. late full bloom to petal fall. D.N.C. 0·4 per cent. at or just after full bloom.

ROKEWOOD AND DEMOCRAT

N.A.A. 10 p.p.m. at or just after full bloom.

DELICIOUS

N.A.A. 7·5 p.p.m. late full bloom to petal fall. D.N.C. 0·2 per cent. at or just after full bloom.

[G. W. GAYFORD, B.Agr.Sc., Senior Horticultural Instructor.]

Standard Herd Test Report

The Standard Herd Test Report which, for a number of years, appeared in the September issue of the Journal of Agriculture, will be published this year and in future years in our October issue.

Prevent Fruit Diseases by Timely Spraying

By J. D. F. BLACK, B.Agr.Sc.,
Assistant Horticultural Instructor

SPRING, the season in which fruit trees burst into leaf and flower, is also the season in which fungous diseases attacking them are most active. The humid conditions generally experienced at that time of the year are particularly favorable for the development of black spot on apples and pears, and shothole and freckle on apricots. Each of these can cause severe economic loss, even in a dry season relatively unfavorable for their development, unless control measures are applied throughout the danger period. This period normally extends from budburst until early November, but termination varies, according to rainfall and humidity, from mid-October to mid-December, or even later. It is unfortunate that in most cases the period of maximum fungal activity coincides with the period at which the young growth and developing fruit are most susceptible to spray damage so that, although there are many fungicides which would control each disease, the number and concentration which can be used on any fruit is strictly limited.

Because of this, the fungicides are used primarily as preventive measures against the disease. It is, therefore, essential to apply them before the disease becomes active, which normally occurs at or about bud burst, and to maintain a spray cover each fortnight until the danger period is over.

Until recently, bordeaux mixture and/or lime sulphur were the only two recognized fungicides for control of the four diseases mentioned above. A series of concentrations had been determined which would give economic control without excessive foliage or fruit damage provided the materials were applied at a specific period and that seasonal conditions were not greatly abnormal. However, their use has definite limitations on some varieties or types of fruit even in normal seasons. For example, no spray can be recommended after the "Early Green Tip" for prevention of black spot on Josephine or Winter Cole pears, and no spray after bud swell on apricots for shothole or freckle. In addition, in some seasons, apples and most other pears could be russeted by lime sulphur or bordeaux cover sprays for black spot control.

During recent years the development of "organic" fungicides has offered prospects for fungus control without damage associated with older materials. It is not possible to make any definite recommendations regarding the use of these newer fungicides until further direct evidence has been obtained by the Department of Agriculture and further accurate experiments have been completed. As many growers nevertheless have already used them and it seems that their use will extend during the coming season, the following comments based largely on growers' experience last season are made for the information of those growers who propose, at their own risk, to adopt these materials on a commercial basis. A progress report of experimental work with these materials by officers of the Biology Branch, will appear in a subsequent issue of the Journal

One thing that can be said definitely is that the Department still considers that the best control of black spot and shothole is given by a programme commencing with bordeaux mixture.

BLACK SPOT OF APPLES

Four new materials which were used by growers last season as cover sprays in controlling black spot of apples are phenyl mercuric chloride, phenyl mercuric fixtan, T.M.T.D. and ziram. There is apparently little difference between these four in their control of black spot, and each appears to be about equal in controlling effect to lime sulphur, but the mercurials may cause a leaf mottle in some varieties to varying degrees. Yates and Delicious appear to be most affected by the mottle, but it may also occur on Granny Smith, Rokewood and Ballarat.

In addition, spray damage to fruit, although rare, has been observed occasionally where a mercurial spray has been mixed with lead arsenate by the grower. This damage appears as a brown ring where a droplet of the spray has dried. It is most important when mixing these materials to follow the manufacturer's recommendation.

At present the cost per 100 gallons of organic mercury sprays is considerably less than T.M.T.D. and ziram. None of them appears to cause russeting of the fruit to the extent that bordeaux or lime sulphur may.

Since the ultimate effect of the leaf mottle caused by mercurials is not yet known, it may be that the safer post-blossom programme where growers desire to try these newer materials would be T.M.T.D. or ziram rather than the mercurials. Users must themselves weigh up the differences in cost against the risks of injury.

A disadvantage of all these materials compared with lime sulphur programme is the absence of any insecticidal effect against bryobia mite. It is therefore recommended that where growers desire to try some of these materials for themselves, they should include a lime sulphur at pink bud, in the spot programme, or else put on a special mite spray—e.g., H.E.P.T. or Parathion.

BLACK SPOT OF PEARS

Results similar to those on apples have been obtained in black spot control on pears, but the leaf mottling effect of the mercurials is much more marked. Josephine and Winter Cole show extreme leaf mottle, but it is also apparent in Packham and Winter Nelis. In addition, it appears that Josephines may suffer a fruit thinning effect from a mercurial spray at or about petal fall. T.M.T.D. or ziram at 0·125 per cent. of the active principle is now recommended by the Department for after-blossom cover sprays on Josephine and Winter Cole, and it appears that they may also be safely used between the "Early Green Tip" bordeaux and petal fall on these varieties. A post-blossom programme of T.M.T.D. or ziram, with a mercurial interposed (except on Josephine and Winter Cole) if black spot becomes apparent, is suggested for pear growers desirous of trying the new materials. As yet, it is *not* recommended that the pre-blossom bordeaux be replaced by one of the new fungicides.

SHOTHOLE AND FRECKLE ON APRICOTS

Although an autumn and spring bordeaux will give economic control of shothole in most years, these sprays have little effect against apricot freckle, which has become increasingly important in the Werribee and Wandin areas over the past few years. The difficulty in controlling these diseases is the extreme susceptibility of the apricot to spray damage, which has previously precluded the application of a fungicide after budburst. T.M.T.D. and ziram have so far not caused any economical damage to apricots and have given very promising results for freckle and shothole control. Apricot growers who have experienced trouble with these diseases and wish to try the new sprays could apply two sprays of T.M.T.D. or ziram 1½ lb. in 100 gallons water plus ½ gallon of white oil this spring with little risk of damage and expectations of control. The first should be applied at "shuck" fall and the second a month later.

As with the previous diseases mentioned, the bordeaux programme at present recommended should still be carefully followed. The newer fungicides simply form a promising *addition* to the established controls.

CERTIFIED PULLORUM-TESTED POULTRY FLOCKS

A certified Pullorum-tested Flock is one which all stock over six months of age have given a negative reaction to the agglutination test for Pullorum Disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector, but it is not necessarily a guarantee of the type of birds in the flock.

The under-mentioned flocks have been certified by the Department of Agriculture, and will remain so for the current calendar year, or until such time as the Chief Veterinary Inspector determines.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

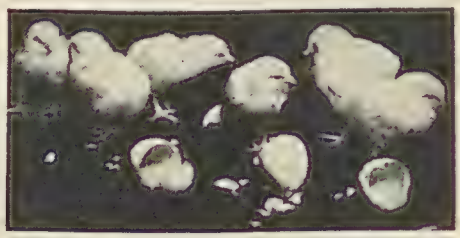
Particulars of breeds of birds tested are as shown hereunder :—

A. Australorp ; B. White Leghorn ; C. Rhode Island Red ; D. Sussex ; E. Langshan ; F. Brown Leghorn ; G. Buff Orpington ; H. Black Leghorn ; I. Minorca ; K. Legbar ; L. Turkeys ; M. New Hampshire ; N. Plymouth Rock ; O. Indian Game ; P. Ancona ; Q. Blue Leghorn.

Owner.	Breed.	Number of Birds.
Adlington, G. A., Maldon-road, Castlemaine	A, B	1,312
Anderson, G., Torbay-street, Macleod	A, B	1,387
Barnes, A., "The Heights," Blackburn	A, B, C	2,400
Barnett, W. H., 17 Brougham-street, Box Hill	A, B	549
Bassett, R., South Muckleford ..	B	135
Bayfield, A. E., Westall-road, Springvale	A, B, C	1,058
Bayfield Poultry Farm (J. E. Robinson), Bayfield-road, Bayswater	A	752
Booth, S. J., Benalla-road, Shepparton	A, B	595
Boyce, A. D., Springvale-road, Forest Hill	A, B	1,455
Bray, J., 18 Hotham-street, Warrnambool	B	123
Casson, D., 20 Avoca-crescent, Pascoe Vale, W.8	A, B, C	1,299
Cook and McKnight, Lyons-road, North Croydon	A	2,326
Corbett Bros., Torbay-street, Macleod	A	2,647
Crawcour and Edmonds, Clarinda Poultry Farm, Centre-road, Clarinda	A, B, C	2,401
Crawcour and Edmonds, Ashgrove Poultry Farm, Mountain-road, Cockatoo	A, B	1,643
Cumming, H. D., Darlington ..	A, B	113
Davey, A. R., Sellars-street, Greensborough	A, B	1,445
Davidson and O'Keefe's Hatchery (Mrs. G. Hocking), 22 Sherbrooke-avenue, Ringwood	A, B, C	664
Davies, L. F., Ireland-road, Spring Vale	B, C	2,581
Davies, R. G., 24 Sherbrooke-avenue, Ringwood	A, B	906
Day, L., Kyvalley	A, B, C	2,252
Dookie Agricultural College, Dookie	A, B	2,074
Ellen, J., Rossmoyne Pig and Poultry Farm, Avoca	A, B	4,558
Ellis, G., Merrigum	A, B	2,616
Etherington, R. R., Karadock-avenue, Irymple	A, B	2,396
Fagg, V. C., 679 Riversdale-road, Box Hill	B, C	582
Firkins, H., Frankston-road, Cranbourne	A, B	2,645
Fitchett, C. W., Springvale-road, Tally Ho	A, B	742
Ford, J. V., 11 Barker-avenue, Shepparton	A, B, C	990
Frost, M. C. (Mrs.), "Araluen," Barwon Heads	A, B, C	1,003
Frye, I. H., Grimshaw-street, Watsonia	A	1,123
Fullerton, G. H., Long Gully, Bendigo	A, B	967
Gibbs, J., Highway Stud, Lower Plenty	A, B	914
Grenville, G. W., Grenville Stud Poultry Farm, Springvale-road, Springvale	A, B, C	3,051
Grice, J., North-road, Langwarrin ..	A, B	998
Gwyther, R., Valley-road, Highton, via Geelong	A, B	1,265
Haigh-Lumby, J., Cranbourne-road, Frankston	A, B	622
Hanson, S. H., Box 7, Kilmore ..	A	43
Hayes Bros., Mt. Dandenong-road, Montrose	A, B	1,893
Hoffman, C. W., 5 Pearl-street, Horsham	A, B	2,985
Holder, G. E. and W., "Seven Acres," Ferntree Gully	A	308
Hurst, B. H. G., New-street, Eltham	B	1,816
Jenkin, H. A., Torquay-road, Belmont	B	665
Johnson, M. (Mrs.), Ivanhoe Poultry Farm, Ferntree Gully	A, B, C	2,147
Kennedy, W. R., Hampton Park ..	A, B	1,110
Kennedy, F., cr. Watson and Ferntree Gully roads, Glen Waverley	C	759
Kerr, J. J., Clarke-road, Springvale	A, B	3,126
Kostos Bros., Waverley-road, Oakleigh	A, B, C	2,904
Kroker, W. E., Horsham	B, C	742
Lambert, D. L. (Mrs.), Donald-road Wheeler's Hill	B, C	92
Le Lievre, R., Katandra	A	734
Longerenong College, Dooen ..	A, B	1,144
Lucas, George, Liverpool-road, Kilsyth	A, B	352
McCabe, R., Gladstone-road, Dandenong	A, B	1,626
McCann, Ian R., Crowlands-road, Stawell	A, B	1,660
McCann, R., and Son, "Moray," Crowlands-road, Stawell	A, B	4,392
McGahy, Mary E. (Mrs.), Manningham-road, Doncaster	A, B, N, O	606
McKay, D., Landell's-road, Pascoe Vale	B, C	4,329

CERTIFIED PULLORUM-TESTED POULTRY FLOCKS—*continued*

Owner.	Breed.	Number of Birds.
McLaren, A. D., Alexander-street, Mooroopna	A, B, C	1,248
McLister, K. C., 173 Hall-street, Spotswood	A, B, C	6,930
McLauchlan, D. F., Rossiter-road, Koo-wee-rup	A, B	1,392
McMahon, G. J., Burwood-road, Vermont	A, B, C	1,217
McQueen, R. J., Spring-road, Highett	C	517
Major, C. D., 59 Simpson's-road, Eaglehawk	A, B	3,232
Mason, David B., Montalbo-road, Ringwood	A, B	1,275
Maytime Stud and Hatchery (R. J. O'Brien), Watson's-road, Glen Waverley	C, D	525
Mills, J. J., Kilvinside-road, Noble Park	A, B, C	1,378
Milner, R. J., 59 Austin-crescent Pascoe Vale, W.8	A, B, E, P, Q	2,585
Modra, L. H., 43 McCulloch-street, Nunawading	A, B	859
Morris, C. H., St. Clem's-road, Doncaster	A, B	524
Mudford, C. A., 15 Kirkwood-street, Eaglehawk, via Bendigo	A	1,005
Mumford, L. J., Healesville ..	A	347
Musgrove, J. M., 16 Wellington-avenue, Blackburn	B	1,261
Myer, Emporium ("Norman Lodge," Mt. Eliza)	A, B	2,320
Neale, S., Edward-street, Boronia ..	A, B	1,038
Nemet, P., Springvale-road, Springvale	A, B, C	3,456
Nicholls, J. A., Nathalia	B	206
Paton, W., Glenburnie-road, Mitcham	B, K	606
Pitman, I. (Mrs.), Kangaroo Ground	D	52
Poulton, Alan W., Vickers-street, Sebastopol	A, B, C	2,156
Rae, John, 277 Albert-street, Sebastopol	A, B	1,835
Reid, R. C., 114 Graham-street, Castlemaine	A, B	938
Ridge and Son, Myrtle-grove, Blackburn	B, C, D	3,527
Ruskin Poultry Farm and Hatchery (A. McVay), Kernot-street, Spotswood, W.14	A, B	3,411
Ryan Bros., Junction-road, Blackburn	A, B	862
Sadler, S., 99 Baynes-street, Terang	A, B	810
Salmond, J. B., Deer Park ..	H, Q	100
Scales, J., and Son, West Wattle Tree-road, Boronia	A	2,263
Schulze, L. H., Torquay-road, Grovedale	A, B	1,749
Simpson, G. D., "Greenways," Mayroad, Glen Waverley	A, B	3,562
Smith, F., Lenham Stud Poultry Farm, Terang	A, B	2,123
Snodgrass, R., Pakenham East ..	A, B	1,366
State Research Farm, Werribee ..	A, B, K	1,200
Stephens, R., Reservoir-road, Kennington	A	1,835
Stewart, H. D., Marshall-street, Maryborough	C, K	417
Stewart, J. A., Maldon-road, Castlemaine	A, B	295
Stoneman, J. W., Campbell-road, Briar Hill	C, F	216
Streeter, H. A., Avoca	B	524
Swift, D. A., Kangaroo Flat ..	A, B	2,045
Taylor, H. L., 180 Surrey-road, Blackburn	A, B, M	288
Taylor, H. R., 119 Rathdown-street, Reservoir	A, B, C	1,941
Taylor, R. H., 132 Rathdown-street, Reservoir	A, B, C	3,874
Thomas, W. A., Springvale-road, Springvale South	A, B, C	1,093
Thomson, G., "Fortuna," Westall-road, Springvale	A, B	1,186
Timms, H. B., 23 Yarra-road, Croydon	A, B, C	162
Trevallyn Poultry Farm (Tubb, F. H.), Sydney-road, Cambellfield	B, C	3,101
Turner, John, Research	C, D	193
Waiting, T., Scoresby-road, Bayswater	A, B	1,735
Waugh, A. J., Kangaroo Flat ..	A, B	856
Wohlers, S., Dooen-road, Horsham ..	A, C	385
Wright, A., Wunghnu	A	700



LICENSED SKIN BUYERS

Sheep Owners' Protection Act

List of persons licensed under the Sheep Owners' Protection Act to buy raw sheep skins. The licences are effective to the 31st December, 1953.

Licence No.	Holder of Licence.	Business Address.
3576	Ainslie, J. D.	Ray-street, Castlemaine
3579	Alexander, H. H.	Kirkland-avenue, Euroa
3585	W. Angliss and Co. (Aust.) Pty. Ltd.	42 Bourke-street, Melbourne, C.1
3575	Argall, L. L.	Redbank
3485	Baker, C. J.	Wood-street, Donald
3452	Baud and Co.	Showgrounds, Ascot Vale
3483	Banks, C. L.	Maroona
3602	Bennett, R. L.	South-road, Warragul
3484	Bennett, S. C. and Son	71 Isabella-street, Geelong West
3547	Berman, D.	294 Little Collins-street, Melbourne, C.1
3525	Biggs, A. E.	Bair-street, Leongatha
3580	Biggs, H. A.	Korumburra
3546	Black, S. B. P.	2 Bradshaw-street, Ballarat
3482	Borthwick, T. and Sons (A'sia) Ltd.	84 William-street, Melbourne
3545	Braybrook Skins and Hides Pty. Ltd.	Somerville-road, Brooklyn
3524	Brooks, E. J.	Guthrie-street, Quambatook
3481	Bryant, A. J. W.	Hanson-street, Corryong
3590	Bryant, S. M.	Walwa
3603	Burford, W. P.	Foster-street, Naracoorte, S.A.
3601	Burford, W. J.	Rolland-street, Naracoorte, S.A.
3523	Burrows, G. A.	27 Scorsby-street, Kerang
3480	Butler, E. and Sons	Main-street, Tallangatta
3564	Bye, H. J.	Horsham
3522	Byerley, H. M.	115 Wright-street, Adelaide, S.A.
3451	Calder, R. W.	Commercial-street, Korumburra
3563	Callan and Sons, P. J.	6–8 Moorabool-street, Geelong
3446	Canfield, A. F.	Box 70, Rochester
3479	Carlile Bros.	Strickland-road, Bendigo
3537	Cary, W. A.	Hospital-street, Heathcote
3478	Claffey, A. S.	Taverner-street, Rainbow
3477	Cole, A.	Hexham-road, Mortlake
3521	Cole, M. and Sons	Camperdown-road, Terang
3520	Cook, T. J.	Black-street, Terang
3562	Cooper, Arthur S. Pty. Ltd.	87 Lambeth-street, Kensington, W.1
3574	Coulstock, K.	65 Welsford-street, Shepparton
3544	Croome, N. J.	313 King-street, Melbourne
3543	Dewez, T., and Co. Pty. Ltd.	Footscray-road, Footscray
3519	Diviny, B.	King George-street, Cohuna
3604	Donald, R. W.	171 Bell-street, Coburg
3518	Duggan, T. A., and Son	Mollison-street, Kyneton
3582	Dwyer, J. P.	23A Mantell-street, Moonee Ponds
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3534	Hicks, Robert	Commercial-street, Kaniva
3514	Hill, Duncan and J. D.	6 Phillip-street, Warracknabeal
3513	Hofbauer, Frank	35 McIlwraith-street, North Carlton
3541	Irwin, F. J.	39 Richmond-crescent, East Geelong
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3470	Jackson, Jas., Pty. Ltd.	Box 16, P.O., Bairnsdale
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3569	McMillan, R. H.	41 Gibney-street, Maffra
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3595	Miles, W. J.	5 Mountain-street, Essendon
3463	Moynihan, J. P.	De Boos-street, Euroa
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3565	Penny, Howard	422 Ascot-street, Ballarat
3497	Permezel, Y. A.	High-street, Yackandandah
3496	Perry, A. J. ..	Princes Highway, Colac West
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3458	Short, I. W. ..	George-street, Hamilton
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3449	Thomas, E. S. ..	16 Hill-street, Bendigo
3527	Thomas, J. C. ..	273 Wattle-street, Bendigo
3445	Thomas, S. S. ..	Cr. Wattle and Victoria streets, Bendigo
3490	Threadgold, R. J. ..	Mann-street, Pinnaroo, S.A.
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3486	Young's Blue Store Pty. Ltd.	Cumming-avenue, Birchip
3548	Zed, A., and Sons Ltd.	Commercial-street, Mt. Gambier, S.A.

QUALITY CHARACTERISTICS OF THE VICTORIAN WHEAT CROP—(*continued from page 400*)

SUMMARY

The protein content of Victorian wheat has been considered and a comparison made with previous years. Physical, chemical and baking tests show that there has been a small improvement in general quality but this change is insufficient to necessitate changes in procedure.

The average protein content was 9·4 per cent. which, although 0·2 per cent. higher than last year, is still relatively low.

Acknowledgment

Acknowledgment is made to the Grain Elevators Board for permission to publish the information contained in this report and to officers of the Board who forwarded samples during the harvest period.

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Photograph on Front Cover—

Jersey herd, owned by Mr. J. A. Till, "Eurarie" Tongala, which gained this year's Standard Herd Test championship award with an average yield of 495 lb. of butterfat.

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ELLIOTTS RURAL LABORATORIES, Elliotts & Australian Drug Pty. Ltd.

By J. A. MORROW, B.Agr.Sc., Senior District Agricultural Officer

SILAGE making provides a means of preservation in succulent form of various fodder crops; of conserving surplus green fodder under conditions where haymaking would be impracticable. The making of silage depends on the development of acids of fermentation in the silage, and when the concentration of these rises high enough they pickle the mass and no further action takes place unless air is permitted to enter. The inclusion and exclusion of air from the mass has a great deal to do with the formation of silage, and the amount of air is controlled by consolidation and pressure on the material being ensiled.

As fermentaion takes place, there is a rise in temperature, the increase depending on the condition of the material and the amount of air in the mass. Some rise in temperature is necessary but, if it is excessive, the silage may be badly damaged. Temperatures of up to 100° F. are suitable for silage making. Above that, the quality and food value will deteriorate and a temperature of 120° F. is much too high for successful silage making. If the temperature is rising too rapidly, it may be retarded by increasing the pressure on the material to exclude more air. The best preventative against heating up and loss of quality in silage is to effectively consolidate the material during filling. This consolidation is relatively easy when the material is green and sappy but, as it matures, greater care must be taken.

The silage can be fed out during the summer as a substitute for succulent greenfeed. It is due to this quality, as well as the fact that it can be made safely in bad hay-making weather, that it is sometimes preferred to haymaking as a means of conserving fodder. Silage is fire and vermin proof and, if properly made, can be stored for many years without deterioration.

Silage can be made from any green fodder possessing a moisture content within the range of 55 to 80 per cent. Very green, "sloppy" material does not make satisfactory silage and, unless this can be permitted to wilt, should not be used. If the material is too mature or dry, it would be better made into hay.

The feeding quality of silage is somewhat lower than that of the material ensiled, and poor quality material cannot be converted to good material by ensiling. On the other hand, the palatibility of some materials is improved and even poor quality silage has a use when more nutritious fodder is no longer available.

A well-sealed stack is satisfactory for short-term silage.

Material containing a high percentage of protein does not ensile well, and some precautions are advisable when it is proposed to ensile material containing a high proportion of legumes such as clover or lucerne. Plants of the cabbage family are unsuitable for silage making. Grasses, green oats, barley, wheat, maize, millet; and the sorghums can be made into excellent silage.

Pasture

The best time to cut grass or pasture is a little earlier than the hay stage or just before flowering of the main grasses. If large quantities are to be harvested, it is better to start earlier in the season so that later cuts will not be too mature. Immature or wet grass taken directly from the mower to the pit or silo will probably result in poor silage. This type of material should be allowed to wilt for a few hours according to the weather and conditions. Later cuts should be carted immediately and the work should proceed more rapidly so that the pressure on the material will be sufficient to compact it as quickly as possible.

Maize

Maize is very suitable for silage making but, in the absence of expensive machinery, much handwork is involved. It must be cut by hand or with a mower in such a way that the stalks all lie in one direction. It must be loaded by hand on to a wheeled vehicle or sledge and carted to the site of the silo. It has the advantage that the yields per acre are relatively high and the harvesting is done in the autumn when other farm work is not so pressing.

The most suitable time to cut maize for silage is in the "doughy" stage or when the cobs are just glazing. When cut at this stage, the maize should be ensiled immediately after cutting. When maize is cut before the flowers appear the material is normally very sappy and tends to become mushy when ensiled. If cut at this stage, it is advisable to allow the material to wilt for a period of up to half a day depending on weather conditions. When chopping equipment is available, satisfactory silage can be made with less labor.

Cereals

Cereals should be cut prior to the hay stage. Either a binder or a mower can be used. If a binder is used, the sheaves may be laid crosswise in the pit or trench and, if the packing is well done, preferably by driving a tractor over the material, it is not essential that the bands be cut. In overhead silos, it is usual for this type of material to be chaffed.

Lucerne

Pure stands of lucerne do not make very satisfactory silage. Where this type of material is to be ensiled, better results may follow if it is allowed to wilt for some time according to the weather conditions and succulence of the crop. In addition, the use of molasses at the rate of up to 40 lb. per ton of material will assist in the production of good quality silage from sappy pure lucerne. The molasses is best applied diluted with an equal quantity of water and added to each sweep load of material. As the crop matures, the amount of molasses added could be reduced. For first-cut lucerne, which normally contains a fair proportion of grasses, or if there is a mixture of species,

the addition of molasses is not warranted and the material could be treated in the same manner as for mixed pasture.

Sorghums and Millet

Sorghum and millet can be ensiled satisfactorily, but it is an advantage to cut them relatively late when the seed is in the advanced "dough" stage.

Thistles and Weeds

It is unlikely that good quality silage will result from using these low-quality plants. The stemmy nature of thistles makes thorough packing and exclusion of air more difficult. There would be some improvement if the stems were all laid in the same direction. If possible, some grass or pasture material should be added to improve quality and assist consolidation.

STORAGE METHODS

Silage may be prepared in stacks, pits or trenches, or in overhead silos.

Stacks

Even under best conditions, stacks cannot be regarded as entirely satisfactory. They involve considerable labor in building and losses are often very high unless used within, say, six months. There is some difficulty in obtaining sufficient consolidation especially around the edges and, on account of the large area exposed, deterioration is considerable. Green succulent material packs better than mature or rather dry material.

In large stacks, losses are relatively lower, but the size will be limited by a number of factors including the maximum diameter over which the material can be conveniently distributed by forking or with a grab-stacker plus forking. Under these conditions, the limit of diameter will probably be 16 to 18 feet, but, with portable stackers, a greater diameter could be used. The size of the stack may also be limited by insufficient material within range of the site, distance of transport and the limited vertical and horizontal range of the mechanical stackers.

The necessity to add a reasonable depth of material each day will also limit the size of the stack. One grab stacker would probably increase the height of loose material by about 8 ft. per day in a stack up to 18 ft. in diameter.

Consolidation at the edges and packing can be made more uniform by continuously varying the position at which the stacker deposits it load. Stacks sometimes settle unevenly due to variations in temperature caused by wind. Greater settling occurs on the lee side where temperatures are higher and, if this is excessive, it may be necessary to protect the windward side by tarpaulins or other means. The erection of poles to

When feeding out silage leave as little as possible of the cut face exposed. Exposure causes deterioration.

enclose the stack is a useful means of guiding the erection of the stack and preventing slipping caused by uneven settling. The settled stack should be at least 6-ft. high, but more preferably 8 or 10-ft. high. As the material sinks fairly rapidly, this will involve topping up to a height of twelve to thirteen feet several times. At least one foot of settled material should be added each day.

In estimating the tonnage of silage, it may be taken that two cubic yards will weigh approximately one ton. This will vary according to the material used and the amount of consolidation. A settled stack of 16-ft. diameter and 8-ft. high would contain about 60 cubic yards or 30 tons. A reasonable crop of oats or pasture (1½ to 2 tons of hay) would yield 5 to 8 tons of silage per acre.

To reduce losses, it is desirable to cover and weight the stacks with loose soil, bags of soil wired together and placed around the edges, and/or logs or other heavy material. Covering with bags or tarpaulins does not give adequate protection and does not supply the weight necessary for consolidation. The addition and removal of the weighting material is fairly costly and, if growth is abundant, it is sometimes more convenient to add extra height, and put up with increased losses rather than cover the stack. This may be warranted if the material is succulent and packs well and if the stack is to be used within a few months. For topping off, succulent or wet material will give more weight and provide a better seal.

Wedge Stacks

A modification of the method of making stack silage has evolved following the introduction of the buckrake. This implement, which consists of a sweep or comb attached to the rear of a tractor with a hydraulic lift, has made it possible to handle silage material very rapidly and with a minimum of labour.

The material is transported with the buckrake to the stack, which is usually in the form of a wedge or bun, and is consolidated by running the tractor over it. The wedge is more conveniently built on a slope and, if care is taken with the consolidation, a high class silage will result. It is not usual to cover such stacks with soil, but a satisfactory seal for short-term storage will be obtained by covering the surface with sappy green material and running the tractor over if for approximately one hour on the first

Rapid filling of stack or pit is essential for the production of good-quality silage.

In pits or trenches silage will keep for many years without deterioation. As a drought reserve, silage stored in this way has many advantages.

day and half an hour each day for the next three or four days, depending on the condition of the top layer.

Pit Silage

For long-term conservation and for provision against droughts, conservation in pits has many advantages. Properly made pit silage will last for many years without deterioration, and, being fire and vermin proof, will not require any special protection. It is not necessary to provide expensive covering or to fence the pit and, as some of the silage is fed out, the remainder can be kept without undue loss.

The pit or trench should have a minimum depth of about 5 feet. With shallower pits, it is difficult to apply sufficient pressure to ensure satisfactory consolidation. If practicable, the trench should be cut into sloping ground with the front end opening to the surface. If desired, the shallow end can be built up with logs or soil which can be removed when emptying commences. By having the trench cut into a hillside, emptying is simplified and, if the floor slopes to the front, drainage will be effective.

The maximum width should be about 12 feet if the pit is to be filled from the sides. Greater widths would make filling by this method more difficult. The sides could have a slope of about 1 in 10 and the back slope should be as steep as practicable depending on the method of excavation and whether vehicles are to be driven through the trench when filling. The length can be varied according to the required capacity.

As with stack silage, it is necessary that the material be consolidated as filling proceeds. With green sappy material, this is relatively easy but, as the material matures, more pressure will be required. This can be applied conveniently by driving a vehicle over the material. It should be packed hard up against the walls and back of the pit to exclude air.

During filling, the material will sink. It is desirable, therefore, that the settled silage in the completed pit should be above ground level so that rainwater will not drain into the pit. During filling, it is a good rule to aim at about one foot of settled material per day. This would mean 5 or more feet of loose material. When making silage from cereals, maize, or other stemmy fodder, much better packing will result from ensuring that all stems lie in the same direction. Greater care is required in packing, and frequent driving of vehicles over the material is desirable to ensure effective consolidation. It is not usual to chaff such material, although this could be done sometimes with advantage.

When filled, the pit or trench should be covered with soil to a depth of about 8 inches or more. The amount of soil required to

To avoid waste the material should be consolidated right to the edge of the stack.

seal the pit will depend largely on the nature of the soil. The soil is best applied by hand after a few furrows have been ploughed around the pit. Scooping the soil to give a uniform layer over the material is difficult. In most cases, hand application is more economical.

There may be further settling of the material after sealing, and cracks may appear in the soil covering. These should be repaired at once. A rake or harrows will usually give good results.

Where the ground conditions are not suitable for the construction of a pit or trench, silage may be made within a wooden or brick structure rising some four or five feet above the ground. This may or may not be set with the floor below ground level. Such structures involve greater expenditure of money and labor and can be recommended only under special circumstances.

Overhead Silos

Satisfactory silage can be made in overhead silos if the material is thoroughly compacted and there are no airspaces adjacent to the wall. For this type of silo the material is usually chaffed and carried into it by blower or elevator. Unchaffed materials frequently present great difficulty in filling the silo and obtaining adequate consolidation.

Overhead silos may be made of various materials such as brick, concrete, or galvanized iron. In the galvanized iron type it is necessary to dress the inside with a lime whitewash to prevent corrosion of the metal by silage acids.

Overhead silos have the advantage that they can be placed close to sheds and other locations where stock are fed, but this could react unfavorably on the fertility of paddocks from which the material was gathered. Longer distance carting and chaffing are other disadvantages. The cost of erection under present conditions is prohibitive, and it would only be in exceptional circumstances that the erection of an overhead silo could be justified.

Book Review

"*Insects Affecting Livestock*," by F. H. S. Roberts, D.Sc., of C.S.I.R.O., published in the Australian Agricultural and Livestock Series by Angus and Robertson Ltd.

"Insects Affecting Livestock" is a valuable addition to the reference libraries of the student, scientist, and producer. The subject is dealt with very completely, and the index gives a quick access to information desired. Up-to-date information is presented on the control and eradication of insect pests as well as the diseases associated with them. The newer insecticides are discussed, and their use is explained.

[D. M. Flynn, B.V.Sc.]

Hop Growing in Victoria

Tests with New Varieties

By A. S. Nash, B.Agr.Sc.,
Hop Research Station, Ringwood

"Turkeys, carps, hops, pickerel and beer
Came into England all in one year."

[Old rhyme

IN England, prior to the fourteenth century, ale was brewed from malt and flavoured with herbs and spices, but about this time, hops were introduced from Flanders. The refreshing bitter taste they imparted to the rather sweet ale was popular and led to the universal use of hops in present-day beers. Hops also exert a considerable influence on the keeping qualities of beer, as the resins they contain have an antiseptic action against many types of bacteria.

Early History of Hops in Australia

When the early settlers came to Australia, they brought with them hop cuttings to enable them to make their own beer and keep their yeast for bread-making in a healthy condition.

Towards the end of the nineteenth century, a large area of hops was being grown in Victoria, but most of our hops now come from the Derwent Valley in Tasmania. In 1952, Tasmania had 1,903 acres under hops, and Victoria 347 acres; the latter grown mainly around Myrtleford, in the Ovens Valley.

Australia's expanding population, and the increasing popularity of beer as a beverage, has led to a large increase in its consumption. Over the last ten years, the quantity consumed has risen from 92,059,559 gallons in 1943, to 178,347,125 gallons in 1952, an increase of 93 per cent. The hop growing industry has not been able to keep pace with this rapid expansion and, over the last few years, brewers have had to import some hops. Although England has surplus hops for export, it is preferable in the interests of internal economy for Australia to produce her own.

Hop-breeding Experiments

Three years ago, Carlton and United Breweries set up a hop-breeding centre at Ringwood, on the outskirts of Melbourne, and also established a hop research farm at Myrtleford. At Ringwood, new varieties

are produced by growing seed from crosses between a large number of varieties, and then testing the individual plants for flavour and suitability to the Victorian climate. Tasmania, with its relatively cooler climate, grows the English varieties to perfection, but Victoria, with its higher summer temperatures, grows the Californian Golden Cluster variety almost exclusively. This variety yields well and has a high resistance to red spider, but the hops have a strong aroma and, although they have plenty of resins, they impart a harsh, bitter flavour to beer. The indigenous American hops are a different species to the European hop. Under good conditions, the American hops will produce a light crop the first year, when planted from cuttings, whereas European hops require at least a season to establish a root system before they come into bearing.

Upper lateral branch of hops (half natural size).

A hop cone showing the central axis or strig with attached bracts and bracteoles. It is much magnified and shows resin glands the size of a pin's head clustered at base of the bracteoles.

The rootstock of the Cluster variety is more susceptible to root-rotting diseases and does not build up a store of reserve plant foods in the rootstock as the European varieties do with their large swollen tap roots. Four Tasmanian varieties have been introduced into the Myrtleford district and it has now been proved that one of them can be grown successfully.

Hops are not planted every year, but are grown in permanent gardens with an overhead pole and wire trellis system. Each spring, the rootstock puts out a number of vines which are trained up coir-yarn strings to the wires which are 15 to 18 feet above the ground. The vines climb by twisting clockwise round the strings and are usually over the top by Christmas time. When mature, the vines are pulled down and the hops are picked and dried in a kiln. The vines die off and are heaped up and burnt before winter. The plant is tolerant of a large range of soil types, but grows best on deep alluvial loams with an open, well-drained subsoil.

In the period of active growth, from December to February, it is very susceptible to adverse conditions and any check is reflected in lowered yields. By January, the plant has produced a large expanse of leaf surface and requires at least 2 inches of rain monthly until the hops are well formed. In most seasons, in Victoria and Tasmania, it is necessary to supplement the normal rainfall by irrigation.

One-year-old seedlings in the hop nursery at Ringwood showing the method of irrigation with overhead sprays.

Sexes in the Hop Plant

The hop plant is unusual in that the sexes are borne on separate plants, but it is the female inflorescence, which consists of a group of flowers on a stalk called the strig, which develops into a cone and forms the hops of commerce. The males produce small flowers and shed pollen which is wind borne. A small percentage of males, 3 to 4 per cent., is enough to ensure adequate pollination. On the Continent and in parts of America, seedless hops of very high quality are grown, but the yield per acre is much lower than with normal seeded cones.

The female hop first appears as a burr, approaching Christmas time and, when the feathery stigmas have been pollinated, protecting petals called bracts and bracteoles, grow out and form the hop cone. On the lower part of the bracts and bracteoles are very small glands which secrete resinous substances, and it is these resins which give the hop its brewing value.

In the normal practice of hop growing, the plants are propagated from cuttings taken from the base of the previous season's vines. The new plant, therefore, resembles the parent in every way. When the seeds from the cone are grown, however, the seedlings exhibit great variation. By making controlled crosses between suitable parents, new varieties can be selected to suit the needs of both grower and brewer. This is the work being carried out at Ringwood, and each year hundreds of seedlings are raised and grown for at least another year.

Selection of Seedlings

It is not until they are in their second season that seedlings produce a crop of hops, and they do not reach maturity until their fourth year. In the second year, rigorous selection is carried out, and the most promising are harvested separately, dried, and then sent to the laboratory for analysis of their resin content. Further selection is carried out and the best eight to ten are picked for brewing test. Small brews are made in a pilot brewery where strict control is exercised over all phases of the process, and the beers, about ten bottles in all, are then subjected to a tasting

test. A panel of qualified tasters is used, as individuals show great variation in their preferences. The final sorting out is carried out in small-scale yield trials and, at the same time, plants are grown in the hop-producing areas to determine their suitability to the soil and climate. At the present stage, five new hybrids have passed most of the above tests and supplies of cuttings are being built up by special rapid-propagating methods.

New Varieties

A brief description of the new varieties, which will soon be available, is given for the benefit of hop growers.

No. 56/1/5—Ringwood Special

Ringwood Special is a hybrid produced from Fuggle, the early-maturing hop of Tasmania. As a yearling, it was very vigorous and produced a crop of hops which analysed 5·42 α resin and 7·34 β resin. In the brewing and tasting trials in 1952, it was ranked low for bitterness and high for quality. Fuggles normally produces an early but light crop with an α resin content of 3·5 to 4 per cent. Ringwood Special is a mid-season variety but it has large attractive cones on long laterals, is easy to pick and hangs well without bruising in windy conditions. Last season, it produced a heavy crop of attractive hops which analysed 6·72 per cent. α resin and 8·88 per cent. of β resin. Sufficient cuttings will be available to plant out an acre of this variety in the spring of 1954.

Two-year-old hops of the Tasmanian Late variety ready for picking, Hop Research Farm, Myrtleford.

56/1/6

A sister seedling of Ringwood Special, 56/1/6 is ten days to a fortnight earlier in maturing. It has large hops on long laterals and is easy to pick. This last season it analysed at 4·79 per cent. α resin and 8·62 per cent. of β resin. The tasting tests placed it near the top for quality.

54/1/35

An improved White Vine, 54/1/35, was obtained by crossing White Vine with a vigorous male. As a seedling in 1951–52 season it bore a small crop of hops. Last year it came into bearing and proved to be an early hop, easy to pick and having white-vine aroma. Normally, White Vines are a reliable mid-season variety with a pleasant aroma but a rather low resin content, the α value is below 3 per cent. 54/1/35 analysed at 5·63 per cent. α resin and 11·06 per cent. β resin this year. The tasting tests placed it first for quality.

36/0/21

A semi-seedless Cluster type, 36/0/21 was obtained by crossing Californian Golden Cluster with an English male. The semi-seedless character appears to be due to sterility. On analysis in 1953 it gave 4·37 per cent. α resin and 9·61 per cent. β resin. A heavy yielder of bunchy hops which are easy to pick and the

(continued on page 448.)

By K. R. GARLAND, B.Agr.Sc., Field Astrologist

THE Murrabit district in the North-western section of Victoria was this State's greatest supplier of broom prior to 1939. However, this crop is now comparatively rare at Murrabit due to the sowing of subterranean clover and rye grass on land opened up by broom millet, and also because summer growing grasses such as wild millet often became very troublesome on land carrying a second broom crop.

Successful broom millet crops have been and still are grown on farms at Tragowel, Appin, and Lake Meran. The crop is one that may appeal to new growers throughout the Kerang–Pyramid area.

The area sown to broom millet by any grower should be governed by the manpower available to him at harvest time. Leading growers have sown up to 50 acres, but as little as 10 or 15 acres would provide a useful, worth-while, yet manageable crop for a beginner.

Soils

Broom millet has grown well on a great variety of local soils, e.g., grey clays of the Murrabit or the Kerang treeless plains, red sandy loams of the Mallee fringe and grey clays of the Tragowel "loose-top" type. Nevertheless, the soil type of highest natural fertility available should be used and salty ground avoided.

Soil Preparation

Reasonably thorough soil preparation is necessary; ploughing to 3 to 4 inches, followed by several workings of the fallow during the weeks prior to sowing, is common. A fine, weed-free tilth should result, but overworking, which reduces some soils to a powder that "cakes" on top following irrigations must not be allowed to occur.

A leading grower strongly recommends irrigation of fallow prior to sowing, but this is not a generally accepted practice. His method has been used on both sandy loam and clay soils with success; frequent working of the soil between the drying of the topsoil after irrigation and the sowing must be given to compact the surface soil.

Harvesting a crop of broom millet

Grading

Grading of the land to give a border check lay-out using bays approximately 1 chain wide is a necessary part of the preparations for the crop. Adequate drains for the quick removal of surplus water are also important as broom millet, particularly when young, will not survive prolonged flooding.

Sowing Time

When the season for frosts has passed, the ground has warmed and the unirrigated "natural" pastures have browned off, sowing may commence. This usually occurs in late October in North-western Victoria. Sowing may take place up to about mid-November, but early sowing is preferred as this allows the crop, often regarded as a 14 to 16 week crop, to reach the cutting and drying stages in February–March while the weather is still good.

Growers, who wish to sow a maximum of broom for the man-power they have available at cutting, often "stagger" their sowings, i.e., use two or three sowings at say fortnightly intervals so that the first-sown crop is cut, dried, and carted before the second-sown crop is mature. Rate of cutting is in the vicinity of 1 acre per day for 4 or 5 men. A team of this size would therefore have cut 8 to 10 acres by the time the first day's cut was dry and ready for tying. If the second-sown crop came to the cutting stage 14 days after the first, the 4 or 5 man team should be ready to continue cutting. Thus a 24-acre crop sown in three fortnightly sowings of 8 acres should occupy 4 or 5 men for six weeks at cutting, tying and carting. This does not, of course, allow for possible upsets due to bad weather. Staggered sowings should only be attempted by experienced growers; beginners may well confine themselves to sowing an area well within their ability to handle.

Sowing Rate

The sowing rate commonly used is 2 lb. per acre, although slightly lower sowings are likely to give better rather than worse crops. One of the best crops ever grown in the Murrabit area was sown at $1\frac{3}{4}$ lb. per acre. The difficulty arises, however, in getting a drill to deliver at such a low rate. The seed is sown mixed with superphosphate—to do this, it is important to thoroughly mix seed and fertilizer on a flat surface, i.e., *not* in the drill box. The percentage germination of broom millet seed is very high.

Sowing, Spacing and Depth

Using a 7-inch interval drill, it is usual to block two out of three of the holes so that the actual spacing between rows becomes 21 inches. Sowing depth is approximately 1½ inch.

Sowing the Seed and Topdressing

A good deal of the seed used locally is purchased from the Tumut area in New South Wales. Growers do, however, often select the best heads of their crops to provide seed for the following year. Bluestone pickling is sometimes practised as a precaution against smut.

Frequently superphosphate only, at the rate of 1 bag per acre, is used locally. Sulphate of ammonia, often recommended for use with this crop, has been tried by at least one grower at 50 lb. per acre with an indication of improved yield. The present cost of this fertilizer may be considered by some broom growers to be prohibitive to its use.

Irrigation

Broom millet sown dry and "irrigated up" or sown on irrigated fallow will require a total of 4 or 5 irrigations. The actual quantity of water which this represents will depend largely on the soil type, but varies between 15 to 24 inches.

Harrowing and Cultivation

Although not often practised on broom millet, harrowing improves a crop which has germinated too thickly. Since the main expenditure attached to the growing of broom millet is the cost of cutting and subsequent handling of the crop, it follows that it should be the aim of growers to produce a relatively small number of large heads or hurls per unit area rather than a larger number of small heads. This explains the emphasis placed on keeping the sowing rate low and also the need for harrowing a thick crop at the seedling stage.

The recommendations for harrowing given by a leading Murrabit grower are as follows :—

1. A light harrowing as soon as the surface is dry enough following the germinating irrigation;
2. A second harrowing when the seedlings are about 1½ inch tall. This harrowing is continued, i.e., the paddock is re-covered once or twice until no broom seedlings are apparent. All harrowings are made across the drill rows.

The above-mentioned treatment may sound very drastic, but it results in thinning the stand to desired proportions. Growers should be guided by the thickness of the seedlings as to the amount of harrowing necessary.

If the crop is badly infested with weeds, cultivation between the rows will be necessary at the 1 to 3 inch stage.

Cutting

The best quality broom millet is cut when the seed is ripening. This means that a desirable green coloration is retained

Threshing the millet

in the fibre. When the seed is ripe a red-brown colour appears at the tips of the hurl or brush next to the seed, and this "seed-stain" lowers the quality of the broom. If the whole of a crop which takes say ten days to cut is to be obtained free of "seed-stain", it follows that the cutting must commence very soon after the millet has flowered. The hurls cut towards the middle of the ten-day period should then be of good quality.

As mentioned above, the months of cutting should be late February to March. A crop sown late and maturing in April–May is subjected to a big risk of being lost through wet weather at harvest.

Benching or Tabling

Before the heads or hurls of millet are actually cut, a process known as benching or tabling must be performed. The object of benching is to place the hurls in a convenient position for cutting, and also to provide a platform on which the hurls are laid out to dry.

Each bench runs parallel to the drill rows for the full length of the paddock and is 3 to 4 drill rows wide. In making a bench, each stalk of millet is bent approximately 3 feet from the ground and the upper part of the stalk laid horizontaly. It is supported in this position by other stalks further down the row which have been similarly bent. If three rows are used for the bench, the left row is bent half-right, the right row to half-left, and the middle row alternatively left and right.

Millet baled and ready for dispatch to the broom factory

When bending and crossing the stalks the bencher must make sure that all the hurls are left hanging over the edges of the bench, i.e., outside the lines of the outer drill rows. Thus all the hurls should be approximately 3 feet from the ground and in two rows along the edges of the bench.

The cutters can now walk between the benches, cut the hurls and lay them, a handful at a time, on the bench. Cutting is usually done using a pocket-knife or dinner-knife; the edge should, however, be more saw-like than smooth. The cut is made 4 to 8 inches down the stalk from the stalk-fibre junction. The portion of stalk left on the hurl is known as the handle. Long hurls should be cut, leaving a short handle and vice versa.

In cutting, the knife is held vertically and stationary (the point of the blade directed towards the elbow, and the back of the knife along the wrist), whilst a stalk is drawn towards the cutter and across the blade. Thus, several hurls may be detached with the knife in the one position. The cut should be at right angles to the handle, leaving a blunt, not pointed butt. Any sheath attached to the stalk should be rubbed off.

The handfuls of hurls—about three hurls deep—are left on the bench to dry. This will take 8 to 10 days in fine weather or longer if showers fall. Some of the uppermost fibres will become sunbleached, but this is only a small proportion of fibre when the heads are three deep.

Knowing when the fibre is dry enough to be carted is largely a matter of experience, but a guide can be obtained as follows:—

If a fibre, when broken away from the hurl at the fibre-handle junction, breaks with a "crack" and appears moisture-free, drying is sufficient. Several fibres at different positions on the benches should be tried when testing the crop.

Broom makers at work :

Lower : The final operation—sewing and trimming

When dry, the hurls are tied in bundles of about 9 inches diameter and carted to sheds. The bundles are placed, one layer deep, butts or handles down, until required for threshing.

In the wetter parts of the State where broom is grown, the crop is carted to drying sheds soon after cutting, but this is not necessary in the North-west irrigation areas as long as the crop is early.

Threshing

For the threshing operation, a spiked roller is used. This is commonly a wooden roller 2 ft. long and at least 1 ft. in diameter. It has 4-inch nails driven into it. About $2\frac{1}{2}$ inches of nail is left protruding from the wood. The nails are placed in rows running " diagonally " across the roller with the rows about 6 inches apart. One side of the roller should be designated the " intake " side and here the nails are placed 5 inches apart within the rows. On the other side they are only $2\frac{1}{2}$ inches apart with intermediate spacings between the edges. The speed of the roller should be approximately 300 to 400 revs. per min. and slightly faster for tough or woolly broom. Four or five hurls can be threshed simultaneously.

Other machines, e.g., harvesters or threshing machines operating very slowly, can be used, but care must be taken that the fibre is in no way bruised or shortened during threshing.

An experienced roller-operator, with two or three assistants to supply and remove the unthreshed and threshed hurls respectively, can thresh approximately 20 to 25 cwt. per day.

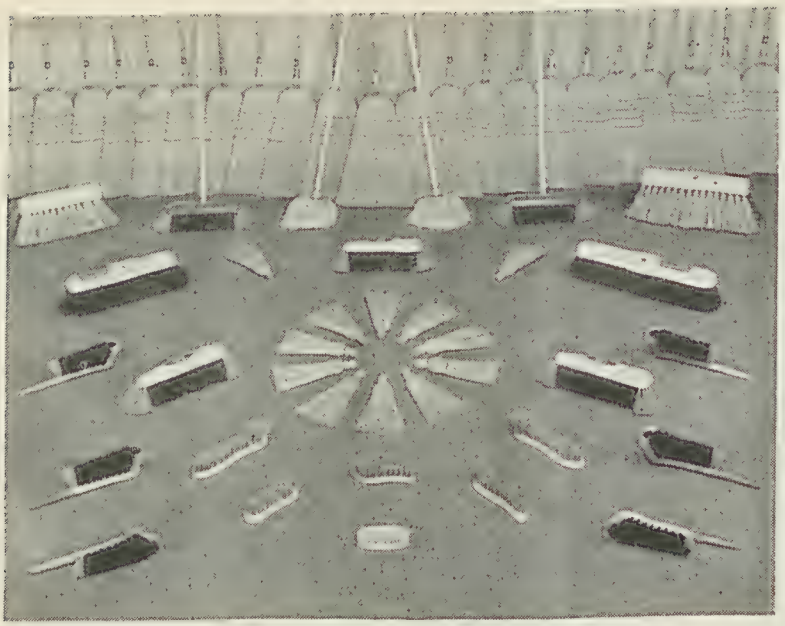
The process of threshing can be very unpleasant due to the release from the broom of a fine, very irritating dust. By wearing a mask to cover eyes, nose, and mouth and by working on the windward side of the roller, some of this unpleasantness can be avoided.

Baling

The bales which weigh 200 to 250 lb. and measure approximately 3 ft. 6 in. to 4 ft. x 2 ft. x 2 ft. 3 in. are produced from home-made presses. The hurls lie parallel to the long sides of the bale, with the tips pointing towards the centre and the butts or handles out at each end. Five wires, evenly spaced along the bale at right angles to the hurls, surround and secure the bale. The height of the bale in the press is reduced from about 4 ft. 6 in. to 2 ft. 3 in. by pressing.

Abnormal Hurls

Besides excessively small hurls, which should be disregarded when cutting, there are at least two other common forms of



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abnormalities. These are (*a*) the central-leader type in which one central fibre is dominant and perhaps 4 to 5 times as coarse as normal; (*b*) the bent-fibre type in which all the fibres of a hurl are bent back in one direction. Such bent fibre also often suffers from "waviness".

Poor hurls of these types should not find their way into otherwise sound bales as they will markedly detract from the over-all value of the bale.

Residue

The paddock residue of millet stalks and leaves is sometimes unwisely burnt, but may be utilized by cutting for silage, grazing by cattle or ploughing into the ground. If grazed and the remainder is ploughed in, useful organic matter will be added to the soil.

The residue of seed not required for sowing and not sold may be used for pig or table poultry food.

Yields

For average crops a yield of 1 ton of fibre from each 3 acres may be expected. The weight of seed obtained normally equals the weight of fibre, but early cut crops will, of course be lighter on seed. Heaviest crops yield up to 15 cwt. fibre per acre.

Acknowledgment

The photographs used in this article were kindly supplied by the Australian Broom Co. Pty. Ltd. Bent-street, Northcote.

HOP GROWING IN VICTORIA—(*continued from page 442*)

hops are much milder than ordinary Cluster. The ratio of dried hops to green weight is very high. It was well to the fore in the tasting tests.

53/1/153

An improved Late from a cross between Tasmanian Late and a Cluster male, 53/1/153 has large attractive hops on long laterals and it is easy to pick. Tasmanian Lates give, on an average, 3·5 per cent. α resin and, this last season, 53/1/153 gave an analysis of 4·06 per cent. of α resin and 9·15 per cent. β resin. In the tasting tests it was judged medium quality and did not exhibit any of the harsh bitterness associated with the Cluster variety.

Thus the range of new varieties covers a good seasonal spread of maturity as it includes two early types, one mid-season and two late ones.

Acknowledgment

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STANDARD HERD TEST

Report for the Year 1952-53

By C. J. BRADBURY, B.Agr.Sc., Supervisor of Herd Testing,
and T. N. EDEY, M.Agr.Sc., Assistant Supervisor of Herd Testing

A review of the year's work shows that 8,886 cows completed lactations in the period 1st July, 1952, to 30th June, 1953, an increase of 276 over last year's record aggregate of 8,610. Counting uncompleted lactations, withdrawals, and exemptions, returns for more than 10,000 cows were handled by the herd-testing staff of the Victorian Department of Agriculture.

THE 8,886 cows included in this report were made up of 3,054 mature cows averaging 330 lb. butterfat, 1,290 four-year-olds averaging 312 lb. butterfat, 1,698 three-year-olds and 2,844 two-year-olds which averaged 294 lb. and 264 lb., butterfat respectively. The overall average of 300lb. butterfat is 6 lb. below last year's average which, at 306 lb. butterfat, was the lowest average since the 1924–25 season.

As indicated in last year's report, there has been no general improvement in per-cow production of Standard Herd Test cows over the past twenty years ; and this year's 300-lb. butterfat average sees a continuance of the steady decline which has been a feature of the post-war period. Since 1946–47, the average production has fallen annually from 351 lb. butterfat to the present average of 300 lb. These figures are summarised in Table 1.

This trend in production is general and is not confined to any particular breed, as shown in Table 2 which gives the breed analysis of production over the last six seasons.

The general position revealed in the last two reports is most disturbing and causes considerable doubts as to whether the owners of stud dairy cattle are making full use of herd-test data in an endeavour to breed better dairy stock.

Table 1.—Summary of Standard and Association Herd Test Figures—1923–1953.

Year.	Standard Herd Test.		Association Herd Test.	
	Number of Cows.	Average Butterfat.	Number of Cows.	Average Butterfat.
		lb.		lb.
1923–24 ..	1,406	285	..	..
1924–25 ..	1,257	315	11,200	..
1925–26 ..	1,249	315	..	..
1926–27 ..	1,207	319	43,432	..
1927–28 ..	1,338	309	..	..
1928–29 ..	1,728	336	63,277	223
1929–30 ..	2,148	330	76,032	226
1930–31 ..	2,385	331	90,360	234
1931–32 ..	2,559	327	89,619	247
1932–33 ..	2,861	354	104,009	241
1933–34 ..	2,681	331	92,953	212
1934–35 ..	2,066	348	79,701	244
1935–36 ..	1,875	341	80,817	233
1936–37 ..	1,595	343	80,528	244
1937–38 ..	1,511	345	86,048	227
1938–39 ..	1,479	338	79,508	221
1939–40 ..	1,644	360	84,690	261
1940–41 ..	2,078	345	60,105	245
1941–42 ..	2,290	353	34,218	235
1942–43 ..	2,169	349	22,154	237
1943–44 ..	2,173	331	27,346	223
1944–45 ..	2,184	334	53,015	218
1945–46 ..	2,752	330	61,738	239
1946–47 ..	3,928	351	79,303	264
1947–48 ..	4,975	343	86,276	252
1948–49 ..	6,186	341	98,208	253
1949–50 ..	7,522	334	105,866	252
1950–51 ..	8,485	310	128,059	239
1951–52 ..	8,610	306	115,669	254
1952–53 ..	8,886	300	..	..

PURPOSE OF THE STANDARD HERD TEST

The Standard Herd Test was begun in 1912 to assist the owners of registered dairy stock to discover the productive ability of their cows and, progressively, to improve their productivity by better breeding practices. It was considered that, through the publication of Standard Herd

TABLE 2.—BREED PRODUCTION ANALYSIS FOR THE PERIOD 1947–48 TO 1952–53.

Year.	Australian Illawarra Shorthorn.		Ayrshire.		Dairy Shorthorn.		Friesian.		Guernsey.		Jersey.		Red Poll.		All Breeds.	
	No.	Butterfat Average.	No.	Butterfat Average.	No.	Butterfat Average.	No.	Butterfat Average.	No.	Butterfat Average.	No.	Butterfat Average.	No.	Butterfat. Average.	No.	Butterfat Average.
		lb.		lb.		lb.		lb.		lb.		lb.		lb.		lb.
1947–48 ..	194	287	357	283	332	291	197	369	204	365	3,546	356	145	330	4,975	343
1948–49 ..	193	307	543	274	304	292	270	368	296	333	4,394	353	186	327	6,186	341
1949–50 ..	322	295	614	272	417	275	317	363	379	326	5,263	347	210	313	7,522	334
1950–51 ..	318	274	714	248	578	263	442	338	444	314	5,776	323	213	293	8,485	310
1951–52 ..	394	262	606	251	629	259	509	311	519	312	5,731	321	219	297	8,610	306
1952–53 ..	397	252	517	238	674	257	501	301	621	299	5,943	313	233	285	8,886	300

Test results, commercial dairymen would be able to select with reasonable accuracy both foundation cows and herd sires to help them increase the productivity of their herds through breeding. This plan was effective while the "pure-breds" maintained a clear margin of superiority over the grades. However, with this margin lessening year by year, the stud breeders must carefully survey the facts and apply better herd-improvement methods in an endeavour to justify their position as breeders of superior bulls for commercial dairy farmers. Better methods must be applied to the selection of both male and female stock. A few comments on current practices in this regard, are offered.

TABLE 3.—AGE DISTRIBUTION OF COWS IN STANDARD HERD TEST.

Age Group.	Number of Cows.	Per Cent.
Two years	2,844	32·0
Three years	1,698	19·1
Four years	1,290	14·5
Mature	3,054	34·4
Total	8,886	100·0

EXTENT TO WHICH SELECTION OF FEMALES IS PRACTISED

Table 3 shows that of the 8,886 cows under test, 2,844 (32 per cent.) were two-year-olds. This high proportion of two-year-olds indicates that breeders must have attempted to rear almost all of the heifer calves born. This means that there is very little selection of female replacement stock practised in herds under the Standard test.

SELECTION OF SIRES

In the 1951–52 report reference was made to the fact that too sparing use is made of sires in stud herds, thus making it impossible in the great majority of instances to obtain a proper evaluation of a sire on the basis of his daughters' productions.

TABLE 4.—CLASSIFICATION OF BULLS ACCORDING TO NUMBER OF DAUGHTERS UNDER STANDARD HERD TEST IN 1951–52.

Number of Bulls.	2,118	255	82	49	14	7	Totals 2,525
Number of daughters under test	1 to 5	6 to 10	11 to 15	16 to 20	21 to 25	Over 25	8,610

As the number of sires with sufficient daughters to permit of a progeny test is very limited, the usual course in selecting a sire is to fall back on the production records of the female ancestors. Buying a bull on the production figures of his female ancestors is a poor substitute for buying the son of a proven sire. However, it is better than no guide at all. But in how many cases can the prospective purchaser of a bull expect to find even the production records for the female ancestors? The following analyses of the present situation in Victoria give the answer to this question.

SUPPLY OF PRODUCTION-BACKED SIRES

An investigation recently conducted indicated that approximately 53,000 dairy sires are in use each year in Victoria. A further

Portion of Guernsey herd owned by Miss I. K. Hearn, "Gunyah", Rochester. The full herd of 20 cows averaged 445 lb. butterfat.

investigation shows that the average sire is used on the farm less than four years. There is, therefore, an annual demand for over 13,000 bulls, and most of these bulls are at present supplied by stud breeders. Without allowing for culling of bull calves at birth it is obvious that about 30,000 pedigree cows would be required to be under test each year, to supply these 13,000 bulls. The actual position in this regard is as follows :—

Estimated number of pedigreed cows in Victoria	40,000
Estimated number of tested pedigreed cows in Victoria ..	18,000
Possible number of bull calves from tested cows per year (50/50 sex ratio) . ..	9,000
But for cows not in calf, and calf wastage to 1 year of age subtract 15 per cent.	1,350
Therefore :	
Number of stud bulls available each year from tested cows ..	7,650

But of these 7,650 bulls 30 per cent. (2,295) would be from first calvers having no production records. Therefore, only 5,355 bulls from dams with one or more records will be available.

A further 20 per cent. (1,530) of the original 7,650 bulls would be from second calvers which could only have one test record. Consequently if we demand (as is reasonable) that a bull's dam have at least two test records only 3,825 such bulls are available. Insistence on three records reduces the number of 2,675 bulls. Since some selection would already have been practised amongst the dams of these 2,675 bulls most of them would be above average quality and probably 2,000 would be suitable for herd sires. This falls far short of the total annual requirement of 13,000 bulls.

QUALITY OF SIRES USED IN STANDARD-TESTED HERDS

A recent investigation to ascertain the production-backing of sires in herds under Standard Herd Test in the 1951–52 season, indicated clearly that many breeders pay little attention to this vital aspect of herd improvement. The table below sets out the production credentials of the dams of the herd sires at the time when these bulls were selected for rearing.

TABLE 5.—SHOWING PERCENTAGE DISTRIBUTION OF NUMBER OF PRODUCTION RECORDS OF BULL'S DAMS AT TIME OF SELECTION OF BULL.

Number of Records	Nil	1	2	3	4	5	Over 6
Percentage of dams in each group	54·7	14·7	10	7·3	4·0	4·0	5·3
Progressive Total per cent.	54·7	69·4	79·4	86·7	90·7	94·7	100

Table 5 indicates that over half the dams had no records when the bull was selected. Only 20·6 per cent. had three or more records. In the compilation of Table 5 no account was taken of the level of production, the number of records being the only factor taken into consideration.

Of course, many of these dams would have been tested for several lactations in later years and may have been proved high-class dairy cows, *but this information was not available at the time the bulls were selected.*

This investigation, therefore, indicates that there is urgent need for more careful selection of herd sires in stud herds. At least three satisfactory test records for the dam should be available before the sire is selected. In conjunction with this there is the need, stressed in the 1951–52 Annual Report, for fuller use to be made of the herd sires selected so that they produce sufficient daughters to permit an evaluation of the bull to be made by a sire survey. It is only through the careful selection of herd sires on the basis of production, their assessment at the earliest possible age by sire survey, and the widest use of those bulls proved above average by their surveys that the desired improvement in production in the stud herds can be achieved.

REVIEW OF THE YEAR'S OPERATIONS

Of the 361 herds tested during the year, 311 had sufficient cows with completed records (at least ten) to have a herd average compiled. Sixty-two of these contained less than fifteen cows and included in their number eleven with average yields exceeding 350 lb. butterfat. Sixty-one of the herds containing fifteen or more cows had average yields of 350 lb. butterfat or more.

In all, 73 herds had average yields of over 350 lb., and these included in their number 24 with average yields of 400 or more and four with an average yield of over 450 lb. butterfat.

THE CHAMPION HERD

The Jersey herd owned by Mr. J. A. Till, "Eurarie," Tongala, gained this year's championship award. With 36 cows, the "Eurarie" herd returned the high average of 495 lb. butterfat. This herd which was placed fourth last year, has been a consistently high performer for a number of years. The eighteen mature cows in this well-composed herd averaged 528 lb. butterfat and included in their number Eurarie Madeira's Duchess and Eurarie Madeira's Silvermine with yields of 688 lb. and 637 lb. butterfat, respectively. High average performance in each age division characterised this herd which gained representation in the senior two-year-old class list with the 559 lb. butterfat record of Eurarie Velvet 4th.

RESERVE CHAMPIONSHIP HERD

The Jersey herd owned by Mr. H. Jackson, of Lockington, which gained the herd championship last year, has, this year, with an average of 490 lb. butterfat for 23 cows, secured the reserve championship award. Lockington Madeira 3rd, with a yield of 678 lb. butterfat, was the highest-producing cow in the herd and was one of six mature cows which averaged 560 lb. butterfat.

Lockington Starlet 5th gained representation in both the senior two-year-old and senior three-year-old class lists with respective yields of 611 lb. and 584 lb. butterfat. With a yield of 480 lb. butterfat, Lockington Buttercup 2nd gained representation in the junior two-year-old class list.

Glenvale Fairy from the Guernsey herd of Mr. A. H. Barclay, "Glenvale", Bamawm, produced 806 lb. butterfat. Fairy is aged eight years.

Four two-year-old heifers of Belgonia Observer 2nd in the herd of Mr. J. A Till, Tongala, winner of this year's championship.

OTHER HIGH-PRODUCING HERDS

With an average of 460 lb. butterfat, the 28 Jerseys owned by Dr. A. R. Haywood, "Windrest" Stud, took third place in the test. The fourteen mature cows in this herd returned an average of 522 lb. butterfat and included in their number four cows with yields in excess of 600 lb., one of which was Windrest Rosemary who, with a yield of 823 lb. butterfat, secured the champion cow award for the year. Windrest Dainty's Chevy 3rd, with a record of 601 lb. butterfat, gained representation in the junior four-year-old class list. Fourth place in the herd championship was gained by the 27 "Rutland" Jerseys owned by Mr. C. A. Masters. This herd averaged 450 lb. butterfat.

Miss I. K. Hearn's herd of twenty cows, which averaged 445 lb. butterfat, obtained fifth position and also pride of place for the Guernsey breed. With a yield of 602 lb. butterfat, Gunyah Diadem was the top producer in the "Gunyah" herd and, with Gunyah Dairymaid (486 lb.), received a placing in their respective age class lists.

The "Le Roy" Stud, owned by Mr. R. J. Hansford, who secured last year's reserve championship award, occupied sixth place

The reserve champion cow, Berry Bank Petunia, a senior four-year-old Jersey in the herd of Mr. W. P. Drechsler, Swan Hill, produced 821 lb. butterfat.

this year with a herd average of 444 lb. butterfat. Of the 73 herds which averaged over 350 lb. butterfat, 24 had average yields in excess of 400 lb. Prominent among these were the Jersey herds owned by Messrs. N. H. Young, T. A. Dickie, P. W. Lineham, and A. E. McKenzie, each with averages of 420 lb. butterfat or better.

In the small-herd section, fourteen Jerseys owned by Mr. R. Lethlean, with an average of 448 lb. butterfat, took pride of place from the eleven Jerseys owned by Mr. F. P. Phillips, which averaged 442 lb. butterfat. Mrs. F. W. Ducat's Jersey herd and Mr. J. Dawson's No. 2 Guernsey herd, were the only other herds in this section with averages in excess of 400 lb. butterfat.

Of the 8,886 completed cow-yields handled during the year, 244 exceeded 500 lb. butterfat, including 39 with yields exceeding 600 lb. and eight more than 700 lb.

THE CHAMPION COW

The award of champion cow went to Windrest Rosemary, a seven-year-old Jersey owned by Dr. A. R. Haywood, Bittern. With 14,171 lb. milk testing 5·81 per cent., Windrest Rosemary produced 823 lb. butterfat. Rosemary has since completed a further lactation and has now, in six completed lactations, aggregated 3,869 lb. butterfat. Each of Rosemary's lactations have yielded productions of over 500 lb. butterfat.

THE RESERVE CHAMPION COW

With a senior four-year-old yield of 821 lb. butterfat from 14,813 lb. milk, the second-highest producer of the year, Berry Bank Petunia, owned by Mr. W. P. Drechsler, of Swan Hill, gained the reserve championship award. Like the champion cow, Petunia has recently completed a further lactation which yielded 828 lb. butterfat. This Jersey cow has now, in four completed lactations, produced 2,807 lb. butterfat.

Windrest Rosemary, champion cow with a yield of 823 lb. butterfat. This mature Jersey cow is owned by Dr. A. R. Haywood, Bittern.

OTHER HIGH-PRODUCING COWS

Yarraview Golden Daffodil, the champion cow of 1950–51 and the highest producer last year, produced 815 lb. butterfat this year. This mature Guernsey cow, the property of Capt. A. E. T. Payne, Lilydale, has now an aggregate of 5,073 lb. butterfat in seven lactations.

Mr. A. H. Barclay's mature Guernsey cow, Glenvale Fairy, was the only other cow to produce in excess of 800 lb. butterfat.

Details of all cows producing 600 lb. butterfat or more are listed later in this report.

The leading junior four-year-old in this year's test, Bemersyde Jean 9th, is owned by Messrs. G. and R. Cox. This Jersey cow produced butterfat totalling 683 lb.

SENIOR FOUR-YEAR-OLD CLASS

With a class average of 320 lb. butterfat, the 575 senior four-year-olds included 25 cows with yields over 500 lb. butterfat and three with yields over 600 lb. butterfat. Leading this class with 821 lb. butterfat is this year's reserve champion cow, Berry Bank Petunia. King's Vale Jessemia 28th is in second place with a yield of 733 lb. butterfat, while Bemersyde Eileen 11th was the other cow in this class to yield over 600 lb. butterfat. Each of the six cows in the class list was of the Jersey breed.

JUNIOR FOUR-YEAR-OLDS

In the year under review, 715 junior four-year-olds completed their lactations and returned an average of 307 lb. butterfat. Among their number were nineteen cows with yields of over 500 lb. and five with yields exceeding 600 lb. butterfat.

Bemersyde Jean 9th, owned by Messrs. G. and R. Cox, gained pride of place with a yield of 683 lb. butterfat from Ladava Brenda (633 lb. butterfat). Following these two Jerseys were two Guernseys, Netherby Grange Duchess and Gunyah Diadem, with yields of 617 lb. and 602 lb. butterfat, respectively.

King's Vale Linda 144th, owned by Messrs. J. Anderson and Son, topped the senior three-year-old list with 640 lb. butterfat.

SENIOR THREE-YEAR-OLDS

In this class of 754 cows, which returned an average of 305 lb. butterfat, the six leading cows were Jerseys. In all, twenty cows produced over 500 lb. butterfat, and these included three with yields greater than 600 lb. butterfat.

Messrs. J. Anderson and Son's King's Vale Linda 144th, with a yield of 640 lb. butterfat, heads this class from Bemersyde Eileen 20th (633 lb.) and Milangil Canary's Fay 3rd (610 lb.).

Jersey cow, Katandra Paxie 3rd, from the herd of Mr. F. A. Burgman, was top senior two-year-old of the year, with a total of 622 lb. butterfat.

JUNIOR THREE-YEAR-OLDS

With a class average of 285 lb. butterfat, the 944 junior three-year-olds contained ten cows with yields in excess of 500 lb. butterfat. The 569 lb. butterfat of Mr. R. J. Hansford's Le Roy Chevy gained her pride of place from Ladava Sister Olive (545 lb.) and the Guernsey, Netherby Grange Duchess (544 lb.).

SENIOR TWO-YEAR-OLDS

Jersey cows again filled all six positions in this class of 828 cows. The class, which averaged 281 lb. butterfat, included seven cows with yields of over 500 lb. and two with yields of over 600 lb. Mr. F. A. Burgman's Katandra Paxie 3rd was the highest producer with a yield of 622 lb. butterfat, while Mr. H. Jackson's Lockington Starlet 5th was in second place with a yield of 611 lb. butterfat. Starlet 5th, with a subsequent production of 584 lb. butterfat, received fifth placing in this year's senior three-year-old class list. Macroom Velveteen 3rd and Eurarie Velvet 4th were the only other cows in this class to produce in excess of 550 lb. butterfat.

JUNIOR TWO-YEAR-OLDS

This class was the next greatest in size to the mature class. With 2,016 cows, it returned an average of 257 lb. butterfat. King's Vale Brunette 9th, with a yield of 534 lb. butterfat, gained a further first placing for Messrs. J. Anderson and Son. "Brunette 9th" was the only cow in this class to yield over 500 lb. butterfat.

Averages, 1952–53

(273 Days Lactation Period)

Class.	Number in Class.	Average Butterfat 273 Days, without Allowances.
		lb.
Junior two-year-old	2,016	257
Senior two-year-old	828	281
Junior three-year-old	944	285
Senior three-year-old	754	305
Junior four-year-old	715	307
Senior four-year-old	575	320
Mature	3,054	330
	8,886	300

(continued on page 474.)

LIVE STOCK NOTES

Compiled by

A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

VICTORIAN LIVE STOCK NUMBERS

LIVE stock statistics for Victoria as at March 31, 1953, obtained from the Victorian Government Statist, show that 66,260 more cattle were being grazed in Victoria than in 1950, the previous record year. The total cattle population of 2,297,208 head is made up of 1,476,780 dairy cattle and 820,228 beef cattle. Dairy cattle numbers show only a slight increase over 1952 figures. Although last summer and autumn were drier than normal, more cows were milking at March 31. Adequate numbers of heifers were available on farms for replacement and the number of dairy bulls, 39,263, was considerably higher than in previous years. There should be no general shortage of dairy cattle during the coming year and with the present good seasonal prospects, dairy production should be high during the year.

Beef cattle numbers were the highest they have ever been in this State and, with the usual movement into Victoria from other States, production of beef should continue at a high level again this year.

Sheep numbers at 21,368,196 were 169,033 fewer than last year's record figure. There has been an increase in the numbers of rams, breeding and other ewes, and wethers. The decline has been amongst lambs, but the number of lambs, 4,232,848 is more than adequate to hold numbers this year, when increased quantities of wool, mutton, and lamb should be produced. The number of Merino rams, 90,162, on farms was only four less than last year. There are considerably more Corriedale, Polwarth, and Dorset Horn rams, but rams of most other breeds declined in number.

Wool, mutton, and lamb production was at a high level; 20,664,590 sheep and 5,275,102 lambs were shorn for a record total of 209,148,024 lb. of wool (201,776,000 lb. in the previous year); 4,469,144 sheep and 3,778,426 lambs were slaughtered for human consumption compared with 3,057,905 sheep and 2,767,648 lambs in the previous year.

Pig numbers have shown a big decline and the number of sows, 26,556, was the lowest for many years, except in 1949, when they totalled 26,181. A further decline in pig production appears inevitable this year.

The number of horses dropped from 169,246 in 1952 to 153,662 at March 31. There are no signs of a halt in the decline in horse numbers even though there is a keen demand for race horses, hacks, and childrens' ponies. The demand for horse flesh for feeding to dogs appears to be overtaking the supply of horses and good draughts. These were down to £6 per head a few years ago, but are now bringing up to £30.

[A.C.T.H.]

LIVE STOCK STATISTICS FOR VICTORIA, 1947–53.

	31st March, 1953.	31st March, 1952.	31st March, 1951.	31st March, 1950.	31st March, 1949.	31st March, 1948.	31st March, 1947.
Horses	153,662	169,246	186,415	200,143	213,090	221,454	227,164
Dairy Cattle ..	1,476,980	1,438,523	1,489,393	1,525,183	1,513,292	1,476,379	1,411,628
Beef Cattle ..	820,228	776,007	726,860	705,765	711,251	697,824	648,433
Total Cattle	2,297,208	2,214,530	2,216,253	2,230,948	2,224,543	2,174,203	2,060,061
Pigs	182,824	213,670	237,127	212,901	223,823	271,492	290,450
Sheep	21,368,196	21,537,229	20,011,933	19,161,043	19,170,312	17,931,173	16,598,490

DAIRY CATTLE NUMBERS FOR VICTORIA, 1947–53.

	31st March, 1953.	31st March, 1952.	31st March, 1951.	31st March, 1950.	31st March, 1949.	31st March, 1948.	31st March, 1947.
Milking Cows ..	673,975	655,127	674,011	715,327	688,514	639,079	646,823
Dry Cows ..	273,086	259,682	269,028	241,231	241,738	257,807	230,382
Springing Heifers	77,242	78,392	78,210	79,812	80,266	78,452	78,935
Other Heifers ..	193,141	197,595	203,585	218,751	224,529	220,122	174,196
Calves	220,273	210,758	227,203	231,104	239,457	243,613	245,783
Bulls	39,263	36,969	37,356	38,958	38,788	37,316	35,509
Total ..	1,476,980	1,438,523	1,489,393	1,525,183	1,513,292	1,476,379	1,411,628

EGG PRODUCTION AND RED MITE CONTROL

Egg production usually reaches its peak during spring. A marked drop or a failure to increase production at this period may prove costly, as the price of eggs is reduced while food prices remain the same. Increased production is essential to compensate for the drop in the price of eggs, and any factor that interferes with egg-laying should be guarded against and, if possible, eliminated.

One of the most common causes of reduced egg production at this time of the year is the red mite. It is the active-breeding period for this pest, and the newly-hatched colonies swarm over the birds at night, sucking their blood and robbing them of their rest and their vitality. Failure to treat for red mite during spring and summer will inevitably result in financial loss.

Routine jobs such as spraying and cleaning of perches are sometimes neglected because they are considered to be unimportant. It is not uncommon to see perches nailed to the supports or made from badly cracked timbers. In some cases the perches are caked with manure, providing a perfect breeding place for red mite. Conditions such as these may be easily remedied. Cleaning and spraying of perches should be given top priority in all poultry farms from September to April. Repairs and general maintenance should be carried out in autumn and winter if they interfere with the spraying operations. Tar oil was once the regular spray used for the control of red mite, but has been largely superseded by D.D.T. solution. An interesting experiment carried out by Mr. D. McQueen, Veterinary Officer of the Department of Agriculture, enables a comparison of the two materials to be made.

D.D.T. v. Tar Oil for Red Mite Control

Five pens were used in this trial. Pen No. 1, treated with 0·1 per cent. D.D.T. remained heavily infested for one month, but appeared to become free during the following four weeks. It is most difficult to suggest a reason, but it is possible that this weak concentration of D.D.T. affected pre-adult stages to a greater degree than the adults, thus leading to a much slower diminution in the number of mites in this pen as compared with others. It is improbable that the mites move from pen to pen, but if this was the case, then the use in the next pen of 1·5 per cent. D.D.T. might have produced this result.

In any case, in practice, it would be wise to use at least a 1·0 per cent. suspension of D.D.T. for control of red mite, although the 0·5 per cent. spray seemed nearly as effective as both 1·0 per cent. and 1·5 per cent., as evidenced by the virtual disappearance of mites at the perch junctions within two months, and the very small numbers found during the period of observation.

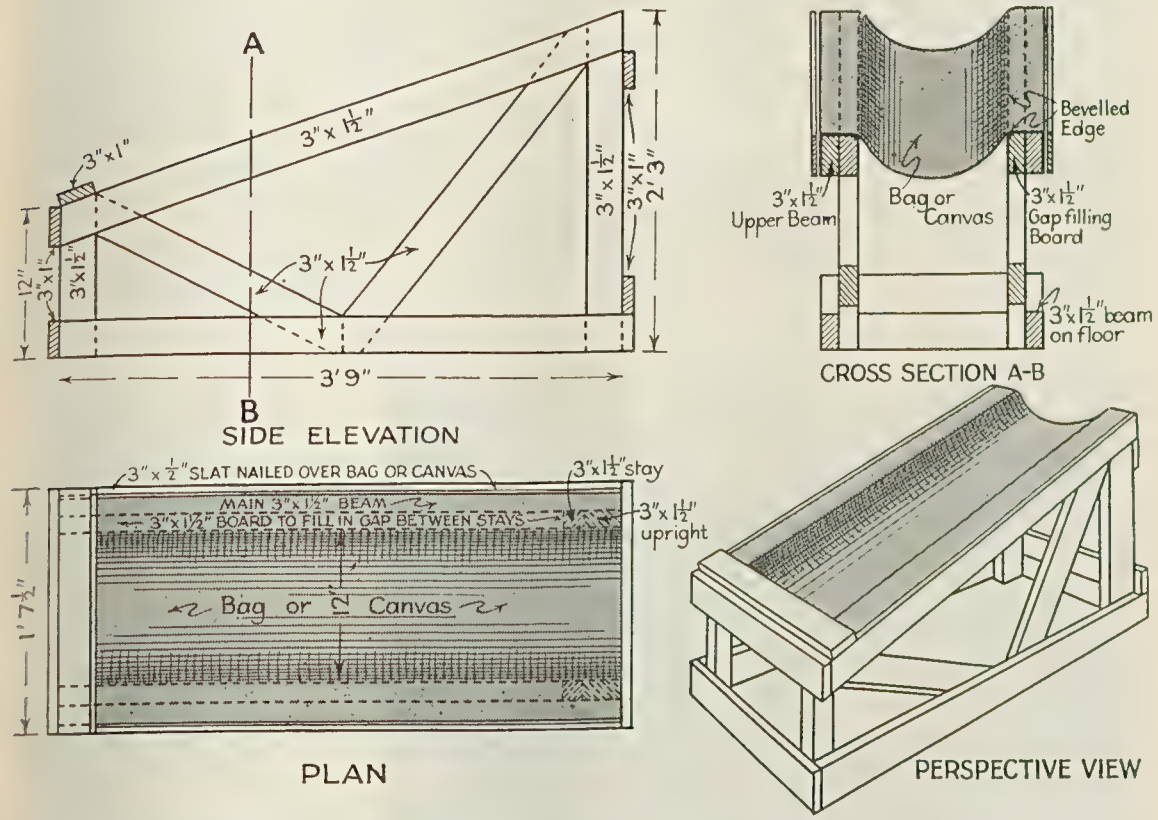
The number of mites found in the pen treated with tar oil, at each observation, was much greater than in the pens treated with the three stronger concentrations of D.D.T. Furthermore, these mites were heavily engorged, which was only rarely the case with mites in the other three pens. It can be assumed that the water suspension of D.D.T. used in this trial exerted a residual effect on the red mite when applied to the perch structures, and that the tar oil was potent for only a short period.

[M. D. Hall, Poultry Expert.]

A SHEEP CRADLE

A cradle for holding sheep for such operations as foot-rot treatment is shown in the diagrams. The cradle is constructed from hardwood and a jute bag for the sling. As only short pieces of timber are needed, there are usually sufficient odds and ends about a farmstead to make a cradle. Most of the timber will be 3 inches x $1\frac{1}{2}$ inch, but heavier timber may be used. There is no point in making the cradle too light or it will move easily. Furthermore, as the operator may sit on the sloping sides while paring the hoofs, narrow boards less than $1\frac{1}{2}$ inch thick will make a seat too narrow for comfort. As the bag in the sling will soon sag, it should be fitted with only a small belly in it. A new bag can be fitted by removing the side slats as illustrated.

The timbers may be nailed on or bolted and, if required, the cradle may be fastened to the floor.



Cradle for holding sheep for footrot treatment and other operations.

Specifications for sheep cradle :—

2—1 ft. pieces of 3″ x 1½″, uprights.
2—2 ft. 3 in. pieces of 3″ x 1½″, uprights.
2—3 ft. 9 in. pieces of 3″ x 1½″, floor rails.
2—4 ft. pieces of 3″ x 1½″, upper rails.
2—2 ft. pieces of 3″ x 1½″, side stays.
2—3 ft. pieces of 3″ x 1½″, side stays.
2—3 ft. 3 in. pieces of 3″ x 1½″ to fill space along upper rails between the side stays.
5—1 ft. 9 in. piece of 3″ x 1″, horizontal end pieces.
2—4 ft. pieces of 3″ x ½″, side slats.
1 jute bag.

These specifications were obtained from a cradle used by Mr. A. H. Bishop, "Hwaiyiu," Woodhouse Estate, Glenthompson, Victoria.

[A.C.T.H.]

NECTAR SECRETION

Two reports recently received from France outlining work carried out since 1949 on environmental factors affecting nectar secretion, will be of considerable interest to Victorian beekeepers. The work has been done on blue gum (*E. globulus*) and swamp mahogany (*E. robusta*), both of which flourish in southern France.

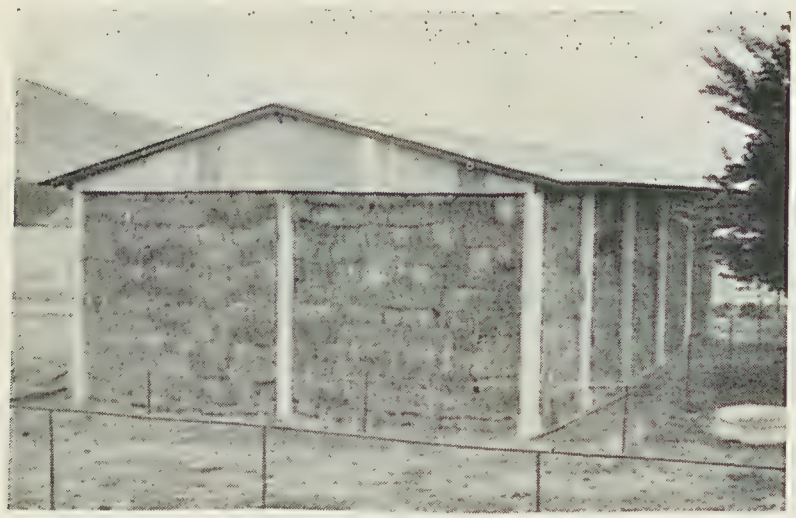
To keep soil conditions as constant as possible, the tests were done in a limited area. Factors investigated were temperature, humidity, and pressure. Nectar was collected from groups of flowers, measured and analysed for sugar content.

The French workers found that, although each factor had a definite and fairly regular effect on nectar secretion, no one of them individually could completely account for the variations in quantity of nectar secreted. After considerable study they found that secretion was very closely related to a complex factor which they designated "TH" composed of elements of temperature, humidity, and pressure.

The sugar content of the nectar was also shown to vary in relation to another complex factor designated "TV" consisting of elements of temperature and volume.

Although these workers have achieved considerable success to date, there is still much to be learned on this subject, especially with regard to other factors such as soil conditions, carbohydrate reserves in the trees, and flowering cycles. Furthermore, the trees at present under test are not among our leading honey flora. The French research team has called on the Victorian Department of Agriculture for assistance in obtaining new material to work on, and seed samples have been despatched. Without casting any reflection on the work carried out in France it must be stated that this field of activity has scarcely been touched yet. It may be possible in future to commence work on the problem in our own country or rather to continue the work commenced on this problem by Miss Gwennyth Wykes and carried on by the French research workers.

[D. F. Langridge, B.Agr.Sc.,
Live Stock Research Officer.]



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This hayshed was erected by Mr. Robert Reid, "The Elms" Gundowring North. 50 ft. x 30 ft. and 15 ft. to the eaves, it holds 100 tons of baled hay. The uprights are concrete pipes of 1 ft. 3 in. diameter filled with concrete, and each is reinforced with three ¾-in. steel rods.

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THE DAIRY FARM

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Use the Dairy Supervisor

Helpful advice on many aspects of dairy farming can be obtained from the local dairy supervisor, who is in a position to visit the farm and discuss any problems on the spot. This is especially helpful in the case of problems such as farm layout, which cannot be satisfactorily solved from a distance.

The supervisors are men of wide dairying experience. Even if they did no more than pass on to others the knowledge they have gleaned from better farms in their own districts they would still be of great assistance to the industry. But they draw on a wider field of knowledge. There is a constant flow of dairying information from headquarters through newsletters and publications. Some of the information is the result of new research or of old experience, and some is contributed by individual supervisors through their reports.

Some inquiries are passed on by these officers to headquarters. For the answers, dairy officers in Melbourne may draw, not only on their own knowledge and on other sections of the Department, but also on other Government departments.

There are also many specialist officers either stationed in the country or visiting it from time to time. But the coverage which can be given by these officers is limited, and the local supervisors can help to make the work of the specialists more effective, as they know the nature and extent of local problems.

In these days of constant demand for better advisory services, dairy farmers should not overlook the possibilities of the dairy supervisor as their local link with the Department of Agriculture.

[K. M. Sillcock.]

Saving of Autumn Pastures

Few farmers in the Swan Hill district close up paddocks in the autumn to provide late winter and early spring grazing, although pasture growth obtained could justify this practice.

To those who think of saving autumn pastures in future, the pasture management on the 38-acre irrigation farm of Mr. F. P. Phillips, of Tyntynder Central, will be of interest. About 32 acres are in pasture and lucerne and this area is divided into 14 paddocks of nearly equal acreage. Two of these paddocks contain subterranean clover and Wimmera rye grass, three are in lucerne, and the rest in permanent pastures. The latter consist mainly of irrigation white clover, prairie grass, perennial rye grass, and a small quantity of lucerne. Two to three of these paddocks of pasture are locked up in the early autumn and saved for late winter feeding. Mr. Phillips states that he has found the prairie grass particularly suitable as it makes good growth through these months.

An interesting feature is the ten-year cycle of pasture renovation which is being applied. Each year one paddock (or, if small, two paddocks) is ploughed up and sown to oats. The following year it is regraded and sown down to pasture or lucerne as required. Lucerne, when sown, is mixed with a small amount of white clover. Sowing takes place at the end of March or beginning of April and this paddock is also fed off lightly during the late winter. All paddocks receive this treatment once every ten years in rotation. This treatment, Mr. Phillips believes, controls the paspalum to desirable limits and also keeps in good condition the soil which, with irrigation, becomes very " tight " after a few years.

The only seed sown is the white clover, prairie grass, rye grass, and lucerne. After experiments over the last few years with most other types of grasses, Mr. Phillips has settled for these only. He is particularly keen to try " H I " rye grass which will be included in the next paddock to be sown.

[J. C. NEWMAN, Dairy Supervisor.]

Boiling Water for Cleansing Milking Machines

It is essential that water used for the cleansing of milking machines by the caustic soda method should be as near boiling as possible, otherwise the whole procedure breaks down. As a reminder, the procedure provides first for at least 1½ gallon of luke warm water through each unit, then at least 1 gallon of boiling water and caustic soda (one tablespoon to four gallons). This is finally followed by 1 gallon of boiling water only.

Some farmers have been attempting to boil water for their milking machines by turning the steam into the wash trough. This practice is useless, much steam is wasted and, owing to the large cooling surface of the trough, the water cannot be brought to a temperature anywhere near boiling point.

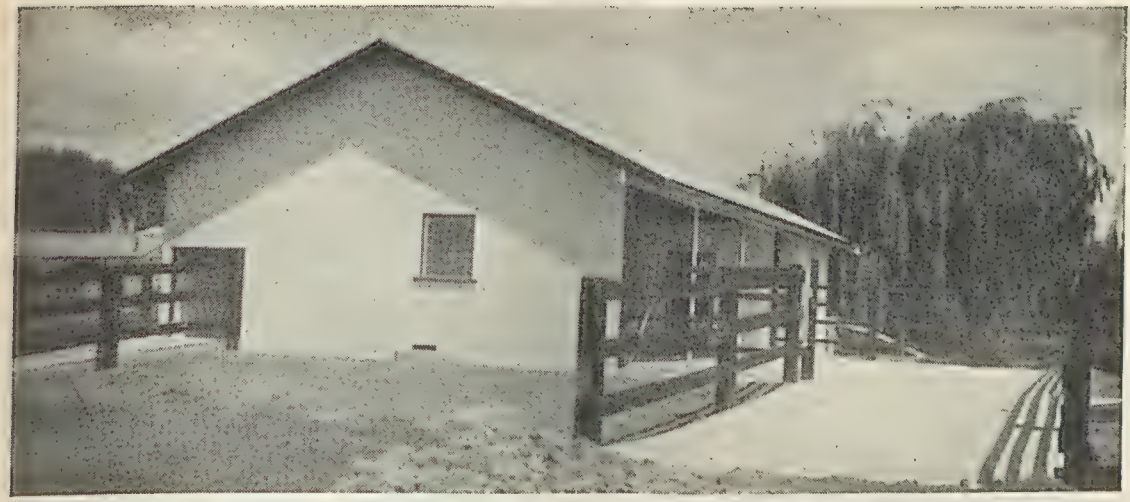
The best practice is to use an old cream can of adequate size. The lid should be left on it and a hole cut in the lid to take a hose from the steam pipe. The smaller cooling surface of the can does not allow so much heat to escape, and the lid will prevent the loss of water once it starts to surge in the can. An old bag or two placed around the can helps to hold in the heat thus cutting down the time taken to heat the water and reducing the amount of fuel required by the boiler.

[J. C. NEWMAN.]

Ropiness in Cream

There may be some farmers who are not familiar with ropiness in cream. When cream is slimy and can be drawn out in threads like treacle it is said to be "ropey". This condition is caused by an organism present in water which has become stagnant in dams, waterholes, and channels.

Ropey cream may result when cows have access to waterholes such as the one depicted. Trough watering greatly reduces risk of contamination.



Once a dairy is built the farmer is committed to part of his farm plan. The site should be chosen carefully.

Actually there are quite a number of different kinds of organisms responsible, the most important being the micrococci and the gram negative bacteria (the so-called *Bacillus lactis viscosus*, and *Bacillus aerogenes*). These are commonly found in water, but in most cases their ability to produce ropiness is only a temporary characteristic. Stagnant water having a large surface area and contaminated by stock will favour the growth of these organisms.

Cows wading in such waters will convey the organism on their tails, legs, udders, teats, and all under parts of their bodies. In this way it is brought to the shed where bail fittings, leg ropes, udder cloths, and the utensils are contaminated. When this happens the trouble may persist for long periods unless every part of the shed and all the utensils are thoroughly sterilized.

The first measure to take is to try to locate the source of the trouble and prevent access of the cows to it. This may be a swampy piece of ground, a muddy channel crossing, or a stagnant water hole. Once the source of the trouble has been located and eliminated it remains then to get rid of the organism present in the shed.

All utensils must be thoroughly sterilized by immersion in actively boiling water for a period of ten minutes. Then clean all bail fittings, floors, and leg ropes, and sterilize them with a sodium hypochlorite solution using a concentration of at least 300 p.p.m. (6 tablespoons of 12½ per cent. sodium hypochlorite in 2 gallons of water). Dry lime sprinkled on the floors would further assist in ridding the shed of the contamination.

[J. C. Newman.]

The Young Farmer

If only we could commence our farming with the energy of youth plus the experience which only time can give us!

Many a dairy farmer must think thus when he contemplates his farm layout, which represents quite a large capital outlay, and thinks what he could do if only he could start over again with nothing but the boundary fences on his farm.

In other matters, such as pasture management and herd breeding, a newcomer may make costly mistakes at first and still redeem them as he gains experience, but in farm layout he is apt to be too deeply committed to make basic changes later.

Therefore, it is of prime importance to study farm layout before you have a farm of your own. Why not study it every time you go to another farm, whether on a field day or for a private visit? Better still, discuss it with the owner. Find out why he has planned his farm as it stands, and what are the virtues and the disadvantages of the plan adopted. The problems may be different from those on your future farm, but there are sure to be some points in common.

(continued on page 467.)

HORTICULTURAL NOTES

Jobs for October

Spray peaches with dry-mix lime-sulphur for rust and brown rot at shuck fall. Use D.D.T. 0·1 per cent. if aphis appears on peaches.

For light-brown apple moth, spray vines immediately after flowering with lead arsenate—3 lb. powder or 6 lb. paste in 100 gallons of water.

Watch out for root borer in traps on apricot and pear trees, and spray with D.D.T. 0·1 per cent. if necessary.

If thrips are prevalent in apple blossoms spray with 0·1 per cent. D.D.T. emulsion.

Spray apples and pears with combination of lead arsenate (quantities as above) and D.D.T. 0·1 per cent. for codling moth and light-brown apple moth at end of October or according to local spray advice.

New Spray Materials Must be Used with Care

OVER the past 6 or 7 years revolutionary changes have been made in the types of insecticides available for horticultural uses. D.D.T. has perhaps been the most outstanding of these insecticides and has given better control of oriental fruit moth and codling moth than was thought possible ten years ago. This material is relatively safe to use and unless continual contact is made with the concentrated material there is little danger to the user. Like arsenate of lead, D.D.T. exhibits little or no controlling influence over woolly aphis or bryobia mite, but it has an adverse effect on *Aphelinus mali*, the parasite of woolly aphis, and the ladybird parasite of bryobia mite. These pests, therefore, have become more serious in commercial orchards over the past years.

New-type insecticides such as Parathion and H.E.T.P. are now fairly widely used for controlling these pests as well as red scale and black aphis of citrus. They are known as "organic phosphates" and are particularly dangerous if the concentrate is handled carelessly or if the dilute solution used in spraying is inhaled or comes in continuous contact with the exposed skin of the operator. For these reasons the Department of Health of Victoria has issued "Regulations Relating to the Use of Certain Pesticides", published in the *Government Gazette*, June 5, 1953. A copy of these regulations may be obtained on application to the Government Printer, Treasury-place, Melbourne, C.2. It is now obligatory for the employer to provide, and ensure the use of protective clothing if an employee is required to use any organic phosphate pesticides. These materials include H.E.T.P. (sold under the trade names of H.E.T.P., Demite, Hetraphos, or other name), Parathion (sold as Parathion, Paraphos, Phosphone, E605, Niram, or other name) and T.E.P.P. (sold as Hexone, Tephos, or other name).

Clothing prescribed for the protection of orchard workers using spray materials named in the regulations (see text).

The protective clothing which must be provided is described in the regulation as consisting of a waterproof hood, or "sou'wester", a full facepiece respirator with charcoal container and filter pad, waterproof overalls and gloves and boots of rubber or other suitable protective material. In addition, the employer must provide six atropine tablets for use as an antidote in the event of poisoning and both he and the employee are required to know the signs and symptoms of poisoning as set out in the regulation, before using any of the above materials. The cost of this equipment is estimated at £30 for each operator.

The use of nicotine sulphate and white oil for controlling black aphis and red scale on citrus would obviate the need for parathion in citrus groves. Nicotine sulphate is ineffective against bryobia mite, but a number of new materials are being tried against this pest by officers of the Department of Agriculture, while some of these indicate promising results for summer control, there is not yet sufficient evidence to warrant recommending any new material. If the recommended winter oil is thoroughly applied to trees during July or August, the overwintering mite eggs can be reduced to a sufficient extent to obviate summer sprays in many seasons or at least to ensure that summer controls will not be required until January or February, when growers may desire to try some of the newer miticides for themselves as alternatives to the more toxic materials.

[J. D. F. Black, B.Agr.Sc.,
Horticultural Instructor.]

THINNING PEACHES FOR HIGHER YIELDS

Golden Queen peach trees and all other early and mid-season varieties, must be thinned by hand to obtain the accurate control of fruit numbers necessary to get the maximum crop of marketable sized fruit. The later-maturing varieties Pullar's Cling and Thiele's Cling are "self-thinning" and should be only lightly hand-thinned. Under Goulburn Valley conditions where fruit is grown mainly for canning, the aim is to get as many fruits as possible over $2\frac{3}{8}$ inch diameter at harvest.

Pruning alone cannot satisfactorily control fruit numbers and should be used only to maintain a balance between fruiting and growth.

It should be realized that the time of thinning and the method of thinning both have considerable control on the ultimate yield of any tree, no matter what cultural treatments are carried out. The average mature tree sets about 1,000 to 2,000 fruit, but unless up to 60 per cent. of the fruit is removed, leaving 700 to 800 fruits, the gross yield will contain a high percentage of undersized fruit. Small fruit may have a market at reduced prices in some seasons, but generally this is uneconomical and growers should aim to produce the maximum gross yield with 80 to 85 per cent. up to canning size.

Timing is Important

Thinning should commence immediately after stone hardening which is about the time of the final drop of fruit. At the Research Station, Tatura, stone hardening commences about mid-November, and is usually completed by November 22 to November 26.

By this time, most imperfectly pollinated fruits have shrivelled and dropped off the tree. This fruit drop is most noticeable if dry soil conditions in the block are associated with hot, windy weather. Having commenced thinning, growers should employ sufficient men to complete all thinning by the end of the third week of December.

Late thinning in January or even February has some influence on ultimate fruit size, but thinning experiments have shown that gross yields are reduced. Therefore, if a tree can carry 750 fruits with early December thinning, then harder thinning would be necessary down to, say, 600 fruits if the same tree were left until January or February.

Early thinning. Experiments on "pre-drop" thinning also show that late October or early November thinning has considerable value in obtaining more fruit up to size. Yields of up to 90 to 95 per cent. of canning-sized fruit have been obtained in average seasons. Other advantages include improved tree vigour and less risk of a high percentage of "smalls" in poor seasons. However, with pre-drop thinning there is some risk of late fruit drops reducing fruit numbers below normal loading in some seasons. The fruit number dropped naturally varies with fruit set and the amount or percentage of fruit removed off the tree when thinning. Trees with light to medium fruit sets having up to 25 per cent. removed when thinning will drop from 200 to 300 fruit at stone hardening,

whereas heavier set trees bearing, say 1,500 to 2,000 fruits, and having up to 50 per cent. removed will drop less than 50 to 100 fruits. Leaving extra fruit on the tree will compensate the fruit drop after thinning to a very limited extent on the lighter set trees, but careful thinning is necessary.

Whatever time of thinning is used, growers should make sure that employees understand the best method of thinning and how much fruit should be left on the tree.

The Number of Fruits to be Left

The number of fruits to be left on the tree depends mainly on the size of the tree. Experimental work shows that the trunk or butt of the tree is a good measure of the top growth or framework. For a number of years at the Research Station, the number of fruits to be left on the tree has been calculated each year from the measurement of the circumference of the butt below the swelling of the crotch. Growers desiring to use this formula should allow 40 fruits for each inch in circumference of the butt for a tree growing under good average cultural conditions. Having obtained the required number of fruits for the tree, count the number of limbs or leaders and assess the average number of fruits to be left on each limb. Then thin down to the number for each limb allowing more or less fruit according to the variations of limb size. Thin a number of trees in this manner and use them as a guide in thinning all trees in the remainder of the block. Broadly speaking 80 to 120 fruits are usually left on each limb of a tree with seven to eight main leaders.

A peach tree of this size could be expected to mature 700 to 800 fruits, most of which would be of canning size.

Which Fruits Should be Removed ?

In thinning, always remove the undersized fruits as these rarely reach canning size. Thin the laterals so that the fruits are spaced 3 to 4 inches apart, and remove misshapen diseased, or damaged fruits. A lateral of 12 inches in length should carry 2 to 3 fruits. Weak laterals with few leaves or fruit on the lower portions of the tree often have undersized fruits, these, therefore, should carry less. Some laterals can be stripped altogether, allowing the vigour to go into the growing wood. Laterals at the top of the tree usually bear larger-sized fruits. Leader tips should be thinned harder to prevent them from breaking during strong winds. Observe the average fruit size on the tree, as small-sized fruits are generally associated with heavy fruit sets, or trees of poor leaf vigour. Such trees should be thinned much harder, otherwise the tree will yield only about 40 to 50 per cent. of marketable-sized fruit. On the other hand, old trees, exceedingly hard-pruned trees, or weakly-growing trees with light fruit sets, need only light thinning to break up bunches, as the number of fruits on the tree is probably insufficient.

The main points of good thinning for higher yields are as follows :—

1. Trees of vigour with heavy sets of small-sized fruits may be thinned early in November. Light to average set trees should be thinned in December.

2. Commence normal thinning as early as possible after the November drop. Aim to complete all thinning before Christmas. Early thinning means higher yields.

3. To assess carrying capacity, use the formula of 40 fruits for each inch in circumference of the trunk or butt of the tree. Make counts from time to time on a few trees to check the extent of thinning. Average trees carry from 600 to 900 fruits depending on tree size. Counting fruits on average-sized limbs—one or two per tree—is a quick method of checking fruit numbers.

4. When thinning, leave that portion of the block with the light set or larger fruit to the last, especially if it is not possible to complete thinning in December.

5. Remove more fruit from young trees.

6. Fruit-size varies from season to season and tree to tree. Trees with large, average-sized fruits may carry higher fruit loading.

7. Don't leave bunchy fruit, especially with early thinning, as the extra size grown usually influences pre-harvest drop. Leave 2 to 5 fruits on laterals of average length.

[G. J. KIDMAN, Field Officer.]

THE DAIRY FARM—(*continued from page 463*)

There are many aspects of farm layout, but perhaps the best approach is to ask these three questions and follow through all that they imply :—

Are the buildings suitably sited ?

Are fences so placed that they give all desirable control of animals and pastures with the greatest possible convenience ?

Are traffic ways so planned that they give the easiest access to the various parts of the farm and to the main road, and will they withstand the traffic of implements and vehicles and the four-times-daily traffic of the herd ?

There are other aspects, such as drainage, water supply, and shelter belts, which must not be overlooked, but the most important thing to understand is the basic planning which may not easily be altered later.

[K. M. SILLCOCK.]

Baling Twine can Injure Cows

Some farmers who feed out baled hay tied with twine are apt to leave the twine lying about where cows have access to it. Some even doubt whether it could harm the cows in any way. It is not uncommon to find that twine has been swallowed by a cow, and that it has formed a ball in the rumen which may seriously interfere with the animal's digestion.

Twine also may become caught between the claws of a cow's hoof where it may twist to form a tourniquet, cutting off the blood supply to one claw. In some cases skin has been known to grow over a piece of twine caught in a cow's hoof.

A little care in the collection of twine and placing it out of reach of cows may save unnecessary digestive upsets and lameness in the herd.

[H. M. ELDER.]

Burnley Egg-Laying Competition

Results of Winter Test

By MARTIN D. HALL, Poultry Expert

THE forty-third egg-laying competition for fowls conducted by the Department of Agriculture at the School of Primary Agriculture and Horticulture, Burnley, commenced on April 1, 1953, and will continue until March 2, 1954, a period of 48 weeks.

The winter test conducted in conjunction with this competition included the first four months (122 days) of the annual test, and concluded on July 31. This test is held each year to give prominence to birds that lay well during the period when eggs are scarce and prices high.

It is considered that egg production on commercial poultry farms can be improved by breeding from birds that have laid well during the autumn and winter months. Consistent layers during that period usually continue to lay at other times of the year.

Apart from a few cold, wet spells, the weather during the winter test was fairly mild. The number of eggs laid is an example of the fecundity and physical soundness of the birds that are awarded prize certificates in their respective classes.

Birds used for breeding should conform to the general standards for size, colour, and body conformation. They should also have laid a large number of first-grade eggs of normal shape, and good quality shell texture. Selection, however, plays an important part in all systems of breeding and should be rigorously applied irrespective of egg production records.

Certificates are awarded for the greatest number of first-grade eggs laid by the three leading birds in all classes, provided a bird lays a minimum of 60 first-grade eggs or more. The percentage of birds having laid 60 or more eggs during the winter test period was 61·2 per cent., the highest for many years.

The following comparative monthly averages for the winter test since 1950 show an increase for the current year:—

MONTHLY AVERAGES, WINTER TEST, 1950–53.

—	April.	May.	June.	July.
1950	15.3	16.1	14.3	16.3
1951	13.9	16.0	15.2	17.7
1952	14.9	16.1	16.7	17.3
1953	16.0	17.1	16.6	18.1

The housing accommodation at Burnley is conducive to high egg production, as each bird is provided with 18 sq. ft. of floor space. The feeding and management practiced at the competition contributes largely to the general health of the birds, which is indicated by a low rate of mortality.

We regret to announce the death recently of Mr. G. McDonald. This White Leghorn breeder was well known in the poultry world and at Burnley for the outstanding performances of his birds.

During the first two months of the competition, a first-grade egg must weigh not less than 1¾ oz. and thereafter not less than 2 oz.

INDIVIDUAL BIRDS—SINGLE TEST

In the class for Australorps, wet mash, Mr. A. H. Brown obtained first prize with a bird that laid 115 first-grade eggs, a meritorious performance.

Second prize was awarded to Mr. R. A. Waugh for a bird that laid 108 first-grade eggs, which is also a very creditable performance, and third prize was awarded to Mr. H. O. Stehn, whose bird laid 103 first-grade eggs.

Mr. W. J. Goddard, and Mrs. F. Waugh obtained equal first prize in Class 1 (White Leghorns—Wet Mash) with birds that laid

106 first grade eggs each. Second prize was awarded to Mr. F. Julyan whose bird laid 99 first-grade eggs.

In the Rhode Island Red class, Mr. R. M. Reid gained first prize, his bird having laid 99 first-grade eggs. Seven Acres Poultry Farm was awarded second prize with a bird that laid 97 first-grade eggs, and Mr. J. R. Armstrong obtained third prize for a bird that laid 95 first-grade eggs.

First prize in the class for White Leghorns, dry mash, was awarded to Mr. A. A. Skinner, whose bird laid 97 first-grade eggs. Mr. L. A. Cook gained second prize with a bird that laid 96 first-grade eggs, and third prize was awarded to Mr. J. B. Horsfall, whose bird laid 94 first-grade eggs.

In the class for " Heavy Breeds other than Australorps " and Rhode Island Reds, wet mash, first prize was awarded to Mr. D. Conroy, whose Chinese Langshan laid 92 first-grade eggs. Mr. W. Cocking was second with a Light Sussex that laid 82 first-grade eggs, and Mr. J. Land, third, with a Chinese Langshan that laid 81 first-grade eggs.

First prize in the class for Light Breeds other than White Leghorns, wet mash, was awarded to Messrs. H. Chalmers and Son whose Legbar laid 87 first-grade eggs, Mr. J. L. Bruce gained second prize with a Legbar that laid 80 first-grade eggs, and Messrs. H. Chalmers and Son also obtained third prize with a Legbar that laid 70 first-grade eggs.

WINTER TEST PRIZE LIST, 1953-54 COMPETITION

INDIVIDUAL BIRDS—SINGLE TEST

Class 1.—White Leghorns—Wet Mash.

EQUAL FIRST PRIZE—CHAMPION CERTIFICATE.

Pen No.	Name and Address.	Total Eggs.	Underweight.	First Grade Eggs.
143	W. J. Goddard, 356 High-street, Bendigo	106	..	106
198	Mrs. F. Waugh, Cemetery-road, Kangaroo Flat	106	..	106

SECOND PRIZE—GOVERNMENT CERTIFICATE.

161	F. G. Julyan, 454 Nepean-road, Brighton East, S.6	101	2	99

Class 2.—White Leghorns—Dry Mash.

FIRST PRIZE—CHAMPION CERTIFICATE.

232	A. A. Skinner, 75 Vincent-street, Sandringham	97	..	97

SECOND PRIZE—GOVERNMENT CERTIFICATE.

210	L. A. Cook, Box 383, Shepparton	101	5	96

THIRD PRIZE—GOVERNMENT CERTIFICATE.

218	J. B. Horsfall, High-street, Doncaster	94	..	94

Class 3.—All Light Breeds other than White Leghorns—Wet Mash.

FIRST PRIZE—CHAMPION CERTIFICATE.

99	H. Chalmers and Son, 9 Lefevre-street, Spotswood (Legbars)	89	2	87

SECOND PRIZE—GOVERNMENT CERTIFICATE.

94	J. L. Bruce, 12 Cedric-street, Ivanhoe, N.21 (Legbars)	80	..	80

THIRD PRIZE—GOVERNMENT CERTIFICATE.

100	H. Chalmers and Son, 9 Lefevre-street, Spotswood (Legbars)	76	6	70

Class 4.—Australorps—Wet Mash

FIRST PRIZE—CHAMPION CERTIFICATE.

Pen No.	Name and Address.	Total Eggs.	Underweight.	First Grade Eggs.
5	A. H. Brown, 43 Collins-street, Thornbury, N.17	115	..	115

SECOND PRIZE—GOVERNMENT CERTIFICATE.

52	R. A. Waugh, Lockwood-road, Kangaroo Flat	108	..	108

THIRD PRIZE—GOVERNMENT CERTIFICATE.

47	H. O. Stehn, 41 Cornell-street, Burwood	103	..	103

Class 5.—Rhode Island Reds—Wet Mash.

FIRST PRIZE—CHAMPION CERTIFICATE.

72	R. M. Reid, Hewlett-road, Tally Ho	100	1	99

SECOND PRIZE—GOVERNMENT CERTIFICATE.

86	Seven Acre Poultry Farm (A. E. Bayfield), Westall-road, Springvale	98	1	97

THIRD PRIZE—GOVERNMENT CERTIFICATE.

62	J. R. Armstrong, 657 Bell-street, West Preston	95	..	95

Class 5.—All Heavy Breeds other than Australorps and Rhode Island Reds—Wet Mash

FIRST PRIZE—CHAMPION CERTIFICATE.

56	D. Conroy, 1 Allison-street, Bentleigh (Chinese Langshan)	92	..	92

SECOND PRIZE—GOVERNMENT CERTIFICATE.

54	W. Cocking, Kilmore East (Light Sussex)	85	3	82

THIRD PRIZE—GOVERNMENT CERTIFICATE.

59	J. Lang, 46 Dundas-street, Thornbury (Chinese Langshon)	90	9	81

Garden Notes for November

By GEORGE HYAM, Horticultural Supervisor

THE FLOWER GARDEN

Floral Displays for the Royal Visit

SUGGESTIONS have been made that some special effort should be made by home gardeners, particularly along the routes taken by the Royal Party in their travels throughout this State. The same suggestion has been made in other States and in New Zealand, and its merits are obvious. Bright gardens, and, where these are not possible, window-box displays, would be surely more pleasing to the Royal Visitors than the rather banal flag and bunting decorations, at least as personal efforts to commemorate the occasion.

Floral displays were an outstanding feature of the Coronation celebrations in London, and these were by no means confined to those created by public bodies.

Her Majesty will be in Victoria from 24th February to 9th March with a visit to Mildura on 24th March. This is a period when gardens, which can be watered in the event of dry summer weather, can be most colourful, and now is the time to make preparations and to consider what is best to plant.

It is not suggested that formal bedding designs should be made; these take some skill and experience to construct properly and require more attention than the average home gardener can afford to give, but rather to create masses of the bright colours which summer flowers can provide. Country residents might also co-operate in growing cut flowers for the decoration of their local reception centre during Her Majesty's brief stoppage there.

Without attempting to suggest any species which should have special preference, the following should be in full flower during the Royal Visit period. There is probably no flower which will give such a quantity and variety of colour than the dahlia. The normal December planting period is rather late for full flowering then, but if these are planted from mid to late November, they will then produce plenty of flowers. Dahlia plants from green cuttings should be planted early in the month as they take rather longer to come into full flower. Warm weather in December and January may produce forward flower stems and thus delay the full display. These are better cut back until the end of January so as to form others which will not flower before the end of February. Apart from manures applied before planting, withhold further feeding until late January and then encourage flowering by fortnightly applications of liquid manure. Also water sparingly until then.

Except in situations well out of the wind, it may be difficult to time gladioli flowers in lowland districts as their flowers soon collapse if exposed to hot winds. In highland districts, gladioli can be at their best in late February and early March, if planted out about 80 to 85 days previously. Gladioli could be a brilliant feature along the route of the visit to Gippsland on 3rd March, or the projected excursion to the Yarra Valley at Warburton.

Roses can be made to produce more flowers than usual in early March by earlier light-summer pruning about Christmas time and some stimulation by liquid manure in January and February.

Carnations, planted out in October or early November, can be relied upon to flower in February to March. Seedlings or rooted cuttings can be used.

A fine display of summer annuals is easier to arrange as the flowering period of most extends over a long period. Borders of phlox, sown in October and November, would make a splendid border in front of dahlias. Other bright bordering plants are petunias which are specially suitable for dry situations and dwarf zinnias or French marigolds. For massed displays there are the tall zinnias, French and African marigolds, Crego asters, balsam, cockscomb, and celosia, all of which should be sown now and planted out before December or they can be sown direct as suggested in last month's notes. Bedding begonias and salvias struck from cuttings or divisions of older plants, if planted out in November, will be mature by the time of the visit.

There seems little point in trying to confine home-garden displays to red, white, and blue flowers or some similar heraldic colours, but rather to utilize the normal colours of the seasonal species to make a brilliant display.

In order that no unfortunate mishap should mar a display, perhaps a little more than ordinary care should be taken in planting, watering, and pest control this summer and to keep everything flowering by not allowing early flowers to seed. Home gardeners should not attempt to force annuals with too lavish feeding or watering. This often results in excessive foliage growth at the expense of flowering. Lawns, too, should be given attention as an untidy lawn will spoil any floral display. Keep them green by applying sulphate of ammonia, 1 oz. per square yard, dissolved in water for an even spread, in December and again in early February. Water well and mow regularly at least once a week in each instance.

Propagating Delphiniums and Lupins from Cuttings

Propagation is the best means of preserving attractive colours. Delphinium and lupin seedlings do not come true to the parent in regard to colour and often not to size of flower stem. More robust plants which will subsequently flower earlier and better are obtained from rooted cuttings rather than by root divisions—the other form of vegetative propagation which is used for these species and which has to be done during the winter.

The best cuttings of both these species are young shoots formed during spring around the base of established crowns taken when they are about 4 inches high and severed with a sharp knife with a slight heel of the crown attached. They can be struck in outdoor beds of light soil which are sheltered by a light frame or some protection which will prevent the soil drying out too quickly but, better still, in individual pots placed under a glass frame until they root. They can be planted out in about eight weeks and will produce some flowers in autumn and a good crown for next season's flowering. With these species, it is desirable to always have a succession of young plants coming on to replace those which have flowered for two seasons. Older crowns will survive but the flowers deteriorate.

As soon as the spring flowers of established lupins and delphiniums fade, their stems should be cut off close to the base to encourage new growth for autumn flowering.

THE VEGETABLE GARDEN

The Egg-plant or Aubergine

Those who like variety in their vegetable diet and home gardeners who like to grow the more uncommon vegetables should be interested in growing the egg-plant. Egg-plant fruits are being offered in increasing quantities by Melbourne fruiterers, these being mainly imported from the northern States. The vernacular name is derived from the fact that, when sliced and fried with bacon, they do somewhat resemble the flavour and the appearance of a fried egg, but, perhaps, the more general use is to boil, bake, or roast slices as for pumpkins or squash and serve with any meat dish, but the flavour differs from that of any cucurbits.

They are of the same family as the tomato, being another solanum species, and the cultivation requirements of both is much the same but the egg-plant needs higher temperatures and, therefore, cannot be planted out with safety before the end of November. As for melons, which were reviewed in these notes last month, in southern areas it is best to either raise the plants under glass for earlier fruiting or to wait until the soil temperature is about 65 degrees, which is the lowest at which their seeds will germinate, and the growing plants need 65–75 degrees to flourish when planted out.

The writer has successfully grown egg-plants by sowing direct in the open ground in late November (three or four seeds to the site, afterwards thinning to one plant) in normal seasons, but they failed during the last two seasons owing to the cool spring and early summer weather of those years. Some authorities claim that pricking-out or even a double transplanting, benefits them, but this has to be carefully done as they resent the least damage to their roots. Seedlings for transplanting are best raised in individual pots and grown on to a fairly advanced stage as suggested for melons.

Egg-plants will respond to the same soil conditions as for tomatoes, but they never do well in soil deficient in humus. The addition of decayed organic matter may be considered essential to a good yield.

Egg-plant (Aubergine).
[After Hawaii Agr. Bull. 9.

The usual garden spacing is about 3 feet each way as a minimum. They are more prone to be affected by any kind of check in steady growth due to cool or dry spells and, if such occur, egg-plants rarely produce properly. They do not do well in soils of low acidity and certainly one which is above pH 6. An American authority considers that most of the diseases affecting egg-plants are favoured by alkalinity and inhibited by acidity. The writer has found that some sieved tan-bark worked in the soil and also used as a top mulch suits them well.

Given the soil and climatic conditions they need, they are naturally prolific bearers and can set many fruits but, in order to produce good-sized fruits, it is usual to restrict the number to about five or six per plant. More may be too small to be usable without waste.

Any necessary cultivation round the plants should be very shallow to avoid damage to their surface roots. If this occurs, the plants will die or the crop will be adversely affected.

Egg-plant fruits are ready for use as soon as they reach a satisfactory size, and while they have a glossy appearance. If dull, they are overmature and seedy and have lost their table quality. The fruits should be cut off with a sharp knife with a small piece of stem remaining. If harvested at the proper stage, egg-plant fruits will keep in good edible condition for about four weeks.

There is not much choice of varieties available from local seedsmen compared with the several obtainable overseas where there are egg-plants of varying shapes and colours as well as some short-season kinds, which should be an acquisition for southern conditions in the State. The only one readily available is the New York Purple, which takes approximately 100 to 110 days from seed to fruiting if not sown in too cool conditions.

As a commercial crop in Victoria, their economic return is doubtful, but the summer rainfall of East Gippsland coastal areas might produce worthwhile crops. In open field conditions in the north they are often affected by hot drying winds.

Capsicums or Peppers

The merits of green peppers are being increasingly recognized as an acceptable ingredient for mixed salads and, if "sweet" or "mild" fleshy varieties are used for this purpose, the more matured red fruits, though slightly pungent, can still be used. The "hot" peppers are long and thin and, when fully ripe or even semi-ripe, they are too pungent for most Australian tastes though, used with discretion for flavoring in proper proportion as in continental cookery, they, too, have decided merits. When the pods of this type are dried, they are useful for imparting piquancy to sauces and pickles. The influx of New Australians is creating some increasing demand for hot peppers, and they are introducing new methods of using them.

Fruits of Capsicums. The "bull-nosed" varieties are used for salads; the long varieties for flavouring.

For salads, the short thick fleshy varieties of sweet capsicums or peppers are the only kinds which will provide the necessary solid flesh. Here again, the number of varieties offered by local seedsmen is small compared with overseas lists. Those listed at present are Californian Wonder, Ruby King, and Bull Nose, all of which do well under our conditions.

There is less difficulty in growing peppers than egg-plants, and the same soil and cultivation conditions as for tomatoes suits them. No pruning is necessary nor do they need stakes if reasonably sheltered from heavy wind. They need slightly warmer soil conditions than tomatoes but rather less than those required by egg-plants. The plants can be spaced 18 inches in the rows and about 30 inches between rows. Peppers are more tolerant to low acidity and will grow in any soil suitable for tomatoes. They also transplant readily and can be raised and transplanted like tomatoes. October or early November is soon enough to sow under open conditions. Earlier-raised seedlings should not be planted out before mid-November in the south and before mid-October in northern districts. At such planting times they will start to fruit about 90 days after sowing and will continue to produce until frosts appear.

Diseases of Egg-plant and Capsicums

Egg-plant and capsicums are subject to most of the diseases and some of the insect pests affecting tomatoes, and the same methods of control should be applied to them. Some of these diseases are seed borne, and dusting the seed before sowing with a copper-oxychloride dust or, better still, subjecting them to the hot-water treatment recommended for tomato seed (immersion in water maintained at 122 degrees for 25 minutes) is always advisable.

Food Parcels for Britain

A Christmas gift scheme under which parcels of foodstuffs may be sent by Australian donors to relatives and friends in Great Britain is again being sponsored by the Victorian Department of Agriculture. The Minister of Agriculture, Mr. C. P. Stoneham, M.L.A., said that the method of sending parcels under the Department's gift scheme this year would be the same as that of last year, when parcels were forwarded by bulk consignment to London, and delivery was made on receipt of addresses forwarded by air-mail. This arrangement meets a public demand, as parcels can be delivered in Britain about three weeks from the date orders are received by the Department of Agriculture. Delivery is guaranteed by the British postal authorities.

The scheme, said the Minister, would enable foodstuffs to be forwarded to those in need, and also would keep Victorian highgrade food products before the British public. The parcel will consist of sultanas, raisins, currants, casserole steak, beef dripping, cheese and canned peaches and will cost 27s. This charge includes packing and delivery to any address in England, Wales, Scotland, and Northern Ireland. Orders will be accepted now, and parcels will be delivered in rotation as soon as the bulk consignment arrives in London in November. Orders endorsed "Oversea Gifts" on the envelope should be forwarded together with a remittance for 27s. to the Director of Agriculture, Department of Agriculture, Treasury Gardens, Melbourne, C.2.

STANDARD HERD TEST—(continued from page 456)

Highest-producing Cows in Each Class of Each Breed since the Inception of the Standard Herd Test

(All Records Cover a Period of 273 Days)

Name of Cow.	Owner.	Age Class.	Year.	Butterfat.
	Jersey.			lb.
Elenko Primrose	Williams, Les	Junior 2	1948–49	605
Katandra Paxie	Burgman, F. A.	Senior 2	1952–53	622
Finchley Bluebell's Duchess	Noble, T. M., and Son	Junior 3	1941–42	802
Mornmoot Princess Madeira	Chirnside, R. H.	Senior 3	1935–36	773
Banyule Tiddlewinks 26th	Banyule Pty. Ltd.	Junior 4	1941–42	935
Babs of Somerville	Hutchinson, J., and Sons	Senior 4	1924–25	843
Clifford Farm Pussy Willow	Eltringham, W. B.	Mature	1943–44	838
	Dairy Shorthorn.			
Churchill Queenie 3rd	Ross, D. M.	Junior 2	1948–49	445
Willow Park Cherry	Atkinson, Estate late W. K.	Senior 2	1922–23	474
Willow Park Fairy	Atkinson, Estate late W. K.	Junior 3	1925–26	528
Willow Park Cherry	Atkinson, Estate late W. K.	Senior 3	1923–24	636
Willow Park Fairy	Atkinson, Estate late W. K.	Junior 4	1926–27	571
Willow Park Camelia	Atkinson, Estate late W. K.	Senior 4	1934–35	576
Willow Park Duchess 35th	Atkinson, Estate late W. K.	Mature	1948–49	791·1
	Friesian.			
Gowerville Lady Beryl	Goodfellow, D. W., and Sons	Junior 2	1950–51	569·1
Burnbank Woodcrest Marchioness	Ferguson, J. H.	Senior 2	1925–26	588
Burnbank Rainfield Patch	Flack and Gamble	Junior 3	1925–26	697
Bainfield Netherland Sulvia 2nd	Syme, O. J.	Senior 3	1926–27	746
Gowerville Claudette	Goodfellow, P. W., and Sons	Junior 4	1949–50	647·7
Halecote Opera Girl	Smith, E. L., and Sons	Senior 4	1927–28	762
Ingolston Gwen	Goodfellow, P. W., and Sons	Mature	1948–49	917·3
	Australian Illawarra Shorthorn.			
Myrtleville Lady Sylvia 2nd	Wilson, J. L.	Junior 2	1947–48	496
Brocka Becky 21st	Tandberg, G., and Son	Senior 2	1949–50	783
Douglas Vale Kassie	Tandberg, G., and Son	Junior 3	1947–48	581
Douglas Vale Grace 2nd	Tandberg, G., and Son	Senior 3	1948–49	538
Douglas Vale Kassie	Tandberg, G., and Son	Junior 4	1948–49	718
Ovensdale Millie 2nd	Wilson, J. M., and Sons	Senior 4	1951–52	555
Douglas Vale Kassie	Tandberg, G., and Son	Mature	1949–50	692·6
	Guernsey.			
Yarraview Admiration	Payne, A. E. T.	Junior 2	1948–49	621·5
Yarraview Rougette	Payne, A. E. T.	Senior 2	1941–52	731
Yarraview Admiration	Payne, A. E. T.	Junior 3	1949–50	739·4
Yarraview Rougette	Payne, A. E. T.	Senior 3	1942–43	778
Yarraview Admiration	Payne, A. E. T.	Junior 4	1951–52	783
Yarraview Golden Daffodil	Payne, A. E. T.	Senior 4	1949–50	766·3
Yarraview Le Mode	Payne, A. E. T.	Mature	1943-44	976
	Red Poll.			
Victoria Energy	Department of Agriculture	Junior 2	1941–42	416
Gipps Lorrain	Warragul High School	Senior 2	1928–29	465
Victoria Panama	Department of Agriculture	Junior 3	1950–51	468·5
Cypress Fancy	McCormack, M., and Sons	Senior 3	1947–48	555·1
Victoria Mistress	Department of Agriculture	Junior 4	1944–45	518
Victoria Johanna	Department of Agriculture	Senior 4	1937–38	514
Victoria Electricity	Department of Agriculture	Mature	1946–47	777
	Ayrshire.			
Inverurie Blue Bell	Goddard, J. H.	Junior 2	1938–39	515
Inverurie Blue Bell	Goddard, J. H.	Senior 2	1939–40	602
Bonnie Doon Beth	Fraser, G. A., and Son	Junior 3	1937–38	684
Inverurie Flirt	Goddard, J. H.	Senior 3	1948–49	775·2
Bonnie Doon Hazelette	Fraser, G. A., and Son	Junior 4	1950–51	721
Inverurie Blue Bell	Goddard, J. H.	Senior 4	1941–42	826
Inverurie Thistledown	Goddard, J. H.	Mature	1948–49	840·5

Highest-producing Cows in Each Class of Each Breed since the Inception of the Standard Herd Test—*continued.*

(All Records Cover a Period of 273 Days)

All Breeds

Name of Cow.	Owner.	Age Class.	Breed.	Year.	Butterfat.
					lb.
Yarraview Admiration ..	Payne, A. E. T. ..	Junior 2 ..	Guernsey ..	1948–49	621·5
Brocka Becky 21st	Tandberg, G., and Son	Senior 2 ..	Australian Illawarra Shorthorn	1949–50	783
Finchley Bluebell's Duchess ..	Noble, T. M., and Son	Junior 3 ..	Jersey ..	1941–42	802
Yarraview Rougette ..	Payne, A. E. T. ..	Senior 3 ..	Guernsey ..	1942–43	778
Banyule Tiddlewinks 26th ..	Banyule Pty. Ltd. ..	Junior 4 ..	Jersey ..	1941–42	935
Babs of Somerville	Hutchison, J., and Sons	Senior 4 ..	Jersey ..	1924–25	843
Yarraview Le Mode ..	Payne, A. E. T. ..	Mature ..	Guernsey ..	1943–44	976

Number of Cows Yielding 500 lb. Butterfat or Over, 1952–53.

Class.	800 to 900 lb.	700 to 800 lb.	600 to 700 lb.	500 to 600 lb.	Total.
Mature	3	3	20	136	162
Senior four-year-old	1	1	1	22	25
Junior four-year-old	..	..	5	14	19
Senior three-year-old	..	..	3	17	20
Junior three-year-old	..	..	..	10	10
Senior two-year-old	..	..	2	5	7
Junior two-year-old	..	..	..	1	1
Grand Totals	4	4	31	205	244
1951–52 Totals	..	11	36	238	285

The Six Leading Herds in this Year's Standard Herd Test.

Stud.	Owner.	Number of Cows Entered.	Average Butterfat Without Allowances.
			lb.
Eurarie (Jersey)	Till, J. A.	36	495
Lockington (Jersey)	Jackson, H.	23	490
Windrest (Jersey)	Haywood, Dr. A. R.	28	460
Rutland (Jersey)	Masters, C. A.	27	450
Gunyah (Guernsey)	Hearn, Miss I. K.	20	445
Le Roy (Jersey)	Hansford, R. J.	30	444

Six Leading Cows in Each Section, Standard Herd Test Report, 1952–53.

Name of Cow.	Owner.	Class and Breed.	Butterfat.
		Mature.	lb.
Windrest Rosemary	Haywood, Dr. A. R.	Jersey	823
Yarraview Golden Daffodil	Payne, Capt. A. E. T.	Guernsey	815
Glenvale Fairy	Barclay, A. H.	Guernsey	806
Windrest Chevy's Betty 2nd	Hodgins, N. G.	Jersey	743
Yarraview Admiration	Payne, Capt. A. E. T.	Guernsey	726
Mornmoot Princess Madeira 41st	Young, N. H.	Jersey	701
		Senior Four-year-old.	
Berry Bank Petunia	Drechsler, W. P.	Jersey	821
King's Vale Jessemia 28th	Anderson, J., and Son	Jersey	733
Bemersyde Eileen 11th	Cox, G. and R.	Jersey	630
Berry Bank Precious Pearl	Drechsler, W. P.	Jersey	591
Le Roy Rosebud	Hansford, R. J.	Jersey	583
Windrest Dainty's Chevy 2nd	Haywood, Dr. A. R.	Jersey	573
		Junior Four-year-old.	
Bemersyde Jean 9th	Cox, G. and R.	Jersey	683
Ladava Brenda	Phillips, F. P.	Jersey	633
Netherby Grange Duchess	Claremont Stud	Guernsey	617
Gunyah Diadem	Hearn, Miss I. K.	Guernsey	602
Windrest Dainty's Chevy 3rd	Haywood, Dr. A. R.	Jersey	601
Lynlea Roseleaf 3rd	Broad, A. J.	Jersey	579
		Senior Three-year-old.	
King's Vale Linda 144th	Anderson, J., and Son	Jersey	640
Bemersyde Eileen 20th	Cox, G. and R.	Jersey	633
Milangil Canary's Fay 3rd	Vallence, H. J. and H. G.	Jersey	610
Warcock Design 3rd	Lawton, J. H.	Jersey	587
Lockington Starlet 5th	Jackson, H.	Jersey	584
Mentone Lynette 2nd	Lethlean, R.	Jersey	572
		Junior Three-year-old.	
Le Roy Chevy	Hansford, R. J.	Jersey	569
Ladava Sister Olive	Phillips, F. P.	Jersey	545
Netherby Grange Duchess	Claremont Stud	Guernsey	544
Berry Bank Gypsy Queen	Drechsler, W. P.	Jersey	539
Ladava Vanilla's Joy	Phillips, F. P.	Jersey	529
Avonview Daisy	Fixter, A.	Guernsey	524
		Senior Two-year-old.	
Katandra Paxie 3rd	Burgman, F. A.	Jersey	622
Lockington Starlet 5th	Jackson, H.	Jersey	611
Macroom Velveteen 3rd	Desmond, J. J.	Jersey	570
Eurarie Velvet 4th	Till, J. A.	Jersey	559
Glenavon Love Lies 8th	Askew, Mrs. S. R.	Jersey	512
Bemersyde Eileen 25th	Cox, G. and R.	Jersey	506
		Junior Two-year-old.	
King's Vale Brunette 97th	Anderson, J., and Son	Jersey	534
Elenko Lassie Belle 2nd	Williams, Les.	Jersey	490
Gunyah Dairymaid	Hearn, Miss I. K.	Guernsey	486
Westbrook Cora	Hollingworth, H. L.	Friesian	485
Rutland Pet 3rd	Masters, C. A.	Jersey	483
Lockington Buttercup 2nd	Jackson, H.	Jersey	480

Herd Averages, Standard Herd Test Report, 1952–53

Owner.	Breed.	Junior 2-year-old.		Senior 2-year-old.		Junior 3-year-old.		Senior 3-year-old.		Junior 4-year-old.		Senior 4-year-old.		Mature.		Total Herd.	Average Butter-fat.
		No.	Average Butter-fat.	No.	Average Butter-fat.	No.	Average Butter-fat.	No.	Average Butter-fat.	No.	Average Butter-fat.	No.	Average Butter-fat.	No.	Average Butter-fat.	No.	
			lb.		lb.		lb.		lb.		lb.		lb.		lb.		lb.
Herds of 15 Cows and Over																	
1. Till, J. A.	Jersey	4	409	2	494	5	460	4	473	2	485	1	531	18	528	36	495
2. Jackson, H.	"	5	411	4	469	1	447	..	..	4	524	3	479	6	560	23	490
3. Haywood, Dr. A. R.	"	5	325	1	502	4	346	1	422	1	601	2	520	14	522	28	460
4. Masters, C. A.	"	3	434	5	447	3	416	3	446	2	444	1	397	10	474	27	450
5. Hearn, Miss I. K.	Guernsey	8	377	1	369	1	400	..	..	2	515	3	529	5	498	20	445
6. Hansford, R. J.	Jersey	4	362	3	374	3	455	4	379	2	509	3	475	11	492	30	444
7. Young, N. H.	"	9	379	2	418	7	419	6	417	4	448	1	457	9	524	38	438
8. Dickie, T. A.	"	9	388	1	414	3	444	1	483	2	535	4	471	5	455	25	438
9. Drechsler, W. P.	"	10	350	2	409	5	419	1	467	2	458	5	530	7	506	32	437
10. Lineham, P. W.	"	10	338	2	410	4	475	1	474	2	424	1	470	14	480	34	430
11. McKenzie, A. E.	"	8	380	1	423	9	453	1	403	1	471	..	..	1	501	21	425
12. Burgman, J. E.	"	6	316	7	405	2	440	3	412	2	448	1	421	11	480	32	420
13. Lawton, J. H.	"	5	322	3	394	1	462	5	476	..	..	2	415	8	441	25	416
14. Anderson, J., and Son	"	6	360	4	340	2	400	3	514	2	458	5	470	13	414	35	414
15. Fixter, A.	Guernsey	2	347	..	..	7	370	..	..	..	..	1	531	6	468	16	414
16. Robertson, J. M.	Ayrshire	1	326	2	424	1	329	2	399	2	392	1	448	7	439	16	412
17. Payne, Capt. A. E. T.	Guernsey	4	302	1	239	3	339	4	373	..	..	3	465	19	454	34	411
18. Christy, W. A.	Jersey	12	333	1	462	3	377	..	..	2	484	2	373	8	511	28	407
19. Gay, W. C. R.	"	3	310	2	346	3	331	1	455	1	474	2	523	5	459	17	405
20. Emmett, Mrs. S. and Sons	"	10	302	2	381	2	340	1	397	1	467	1	278	16	474	33	400
21. Coleman, R. H.	"	7	346	1	286	1	400	2	301	2	406	2	433	8	470	23	398
22. Broad, W. A.	"	10	337	2	394	2	409	2	398	2	473	1	503	6	446	25	396
23. Watson, R. G.	Guernsey	5	361	1	498	1	360	1	449	1	348	..	..	8	399	17	391
24. Phillips, J. H.	Jersey	4	310	4	342	2	413	2	420	..	..	..	..	8	440	20	390
25. Cox, G. and R.	"	9	289	4	394	4	302	2	461	3	496	3	467	8	454	33	389
26. Barclay, A. H.	Guernsey	3	351	5	331	1	304	2	378	..	..	2	354	6	486	19	389
27. Burgman, F. A.	Jersey	7	283	6	395	..	..	2	450	1	373	3	433	15	419	34	388
28. Williams, Les.	"	9	334	4	426	2	476	9	388	2	453	..	..	9	389	35	387
29. Cox, A., and Sons	"	21	327	9	368	2	384	7	413	4	435	2	445	14	451	59	386
30. Dowel, H. H., and Sons	"	4	303	..	..	..	..	..	..	..	..	..	..	11	415	15	385
31. Hollingworth, H. L.	Friesian	9	348	9	393	..	..	4	366	2	373	1	516	11	396	36	382
32. Phillips, J. A.	Jersey	8	309	..	..	5	380	..	..	..	..	8	415	9	418	30	382
33. Cromb, J. D.	"	4	343	1	369	3	379	1	440	2	318	..	..	13	395	24	379
34. Clarke, F. W.	"	8	312	3	363	5	401	3	396	5	377	1	460	14	400	39	378
35. Bennett, R. H., and Sons	"	7	289	3	338	2	423	..	..	..	..	..	..	9	451	21	378
36. Harvey, estate of the late Hon. T.	"	11	301	1	434	4	393	1	364	2	438	1	343	20	409	40	377
37. Farrell, W. A., and Son	"	10	332	1	342	2	345	5	336	1	448	2	413	5	480	26	375
38. Delaney, Mrs. H. A.	"	5	311	2	390	2	370	6	426	..	..	2	382	8	373	25	375
39. Carne, W. J.	"	8	323	..	..	3	371	..	..	4	427	1	437	3	414	19	373
40. Stephens, H.	"	1	301	3	294	2	375	2	349	1	380	3	465	5	883	17	372
41. Hodgins, N. G.	"	4	291	1	380	3	369	1	512	3	353	..	..	8	399	20	371
42. MacLean, F. P.	"	5	329	1	347	3	397	2	439	..	..	2	381	5	371	18	371
43. Harrison, B.	Friesian	2	320	..	..	2	408	4	338	1	287	..	..	7	402	16	369
44. Ballarat Orphanage	Jersey	13	293	2	307	4	377	1	305	5	408	3	389	25	403	53	368
45. Vallence, H. J., and H. G.	Friesian	..	..	..	..	3	261	5	337	3	389	..	..	4	470	15	368
46. Askew, Mrs. S. R.	Jersey	4	312	5	365	2	308	2	471	..	..	1	379	9	380	23	367
47. Broad, Mrs. A. A.	"	2	281	4	337	2	325	2	380	2	342	2	418	6	417	20	367
48. Bennett, J. W.	"	10	292	8	317	11	338	3	451	4	317	3	362	27	411	66	363
49. Biggar, R.	"	13	324	5	279	3	328	2	415	7	380	..	..	10	445	40	363
50. Read, estate of the late J. D.	"	8	263	2	273	2	275	3	363	5	387	2	408	13	419	35	360
51. Trevaskis, F. T.	"	8	326	..	..	3	264	1	372	2	386	3	353	10	410	27	359
52. Ludeman, Lyell C.	"	5	286	1	282	3	329	7	349	5	335	3	362	13	408	37	357
53. Desmond, J. J.	"	11	323	7	355	1	211	1	558	2	451	3	316	6	400	31	357
54. Leach, W.	"	8	290	3	317	2	357	..	..	4	362	2	403	7	420	26	353
55. Gardiner, C. B.	Friesian	3	283	..	..	2	400	6	343	2	429	..	..	7	354	20	352
56. Hardie, R. B.	Jersey	14	298	5	332	5	339	..	..	2	400	10	358	16	397	52	351
57. McFarland, R. A.	"	11	309	3	303	5	346	..	..	3	351	2	373	16	388	40	351
58. Butcher, F. T.	Red Poll	3	303	5	329	4	291	4	294	2	387	3	367	18	381	39	350
59. Chadderton, J. E.	Jersey	4	337	2	323	2	328	1	398	5	324	3	334	9	381	26	350
60. Claremont Stud	Guernsey	..	..	1	403	3	242	2	389	4	376	1	477	6	343	17	350
61. Fraser, G. A., and Son	Ayrshire	2	314	1	415	1	247	1	446	2	298	1	364	7	364	15	350
Herds of 10 to 14 Cows																	
1. Lethlean, R.	Jersey	3	449	..	..	2	383	3	406	..	..	2	512	4	481	14	448
2. Phillips, F. P.	"	5	403	2	324	2	537	..	..	1	633	..	..	1	493	11	442
3. Ducat, Mrs. F. W.	"	1	293	2	359	2	434	1	456	..	..	1	481	7	444	14	423
4. Dawson, J., No. 2	Guernsey	1	363	2	362	2	404	5	417	..	..	..	..	1	582	11	415
5. Broad, Mrs. E. E.	Jersey	6	357	1	478	1	439	3	386	..	..	1	478	1	468	13	397
6. Bertram, A. E.	"	5	374	..	..	..	..	..	..	2	411	1	382	2	450	10	397
7. Collins, R. A.	"	3	315	..	..	..	..	..	..	..	..	..	..	7	426	10	393
8. Bellamy, F. A.	"	6	373	3	354	4	427	..	..	..	..	..	..	..	..	13	385
9. Stephens, Dr. F. G.	Guernsey	5	320	1	366	1	268	..	..	1	146	..	..	6	471	14	372
10. Salesian College	Friesian	..	..	2	302	1	363	2	285	2	336	..	..	7	393	14	354
11. Tyssen, C. J.	Jersey	5	295	..	..	1	372	1	389	1	336	..	..	5	403	13	353
12. Stracey, J. D.	"	1	376	..	..	2	432	..	..	5	311	1	350	1	382	10	352

Feed shed on property of Mr. J. A. Till, Tongala. Chaff is blown from a cutter to a loft over the outlet race from cowshed. It is then run to the cow-bails through a simple but very effective chute.

List of Cows Producing 600 lb. Butterfat or Over, Standard Herd Test Report, 1952-53.

Name of Cow.	Owner.	Age (Years and Months).	Breed.	Butterfat.
				lb.
Windrest Rosemary	Haywood, Dr. A. R.	7 3	Jersey	823
Berry Bank Petunia	Drechsler, W. P.	4 9	Jersey	821
Yarraview Golden Daffodil	Payne, Capt. A. E. T.	8 4	Guernsey	815
Glenvale Fairy	Barclay, A. H.	8 4	Guernsey	806
Windrest Chevy's Betty 2nd	Hodgins, N. G.	6 6	Jersey	743
King's Vale Jessemia 28th	Anderson, J., and Son	4 11	Jersey	733
Yarraview Admiration	Payne, Capt. A. E. T.	6 5	Guernsey	726
Mornmoot Princess Madeira 41st	Young, N. H.	7 3	Jersey	701
Windrest Island Star 2nd	Haywood, Dr. A. R.	10 11	Jersey	693
Eurarie Madeira's Duchess	Till, J. A.	7 0	Jersey	688
Bemersyde Jean 9th	Cox, G. and R.	4 3	Jersey	683
Lockington Madeira 3rd	Jackson, H.	6 1	Jersey	678
Le Roy La Mode	Hansford, R. J.	7 5	Jersey	646
King's Vale Linda 144th	Anderson, J., and Son	3 11	Jersey	640
Eurarie Madeira's Silvermine	Till, J. A.	7 11	Jersey	637
Bemersyde Eileen 20th	Cox, G. and R.	3 6	Jersey	633
Ladava Brenda	Phillips, F. P.	4 0	Jersey	633
Windrest Dainty's Chevy	Haywood, Dr. A. R.	5 9	Jersey	631
Bemersyde Eileen 11th	Cox, G. and R.	4 11	Jersey	630
Lockington Renta 3rd	Jackson, H.	5 4	Jersey	629
Glenvale Clarice 2nd	Barclay, A. H.	7 9	Guernsey	626
Mornmoot Northwood Madeira 22nd	Young, N. H.	7 9	Jersey	626
Shenstone Dawn 3rd	Emmett, Mrs. S., and Son	8 2	Jersey	623
Noonavale Aim's Fowler 6th	Lyttle, A.	7 9	Jersey	623
Katandra Paxie 3rd	Burgman, F. A.	2 11	Jersey	622
Du Val Chance	Vallence, H. J. and H. G.	6 10	Friesian	622
Karindee Lorraine	Burgman, J. E.	7 10	Jersey	622
Netherby Grange Duchess	Claremont Stud	4 0	Guernsey	617
Maryville Etna	Butcher, F. T.	11 10	Red Poll	612
Ullina Dainty	Christy, W. A.	8 2	Jersey	612
Lockington Starlet 5th	Jackson, H.	2 11	Jersey	611
Milangil Canary's Fay 3rd	Vallence, H. J. and H. G.	3 10	Jersey	610
Berry Bank Daphne's Dream	Drechsler, W. P.	5 11	Jersey	610
Bemersyde Design's Eileen 5th	Cox, G. and R.	7 9	Jersey	607
Grangelea Ronda	Broad, Mrs. A. A.	9 0	Jersey	603
Gunyah Diadem	Hearn, Miss I. K.	4 5	Guernsey	602
Windrest Dainty's Chevy 3rd	Haywood, Dr. A. R.	4 4	Jersey	601
Windrest Chevy's Rosebud	Haywood, Dr. A. R.	5 4	Jersey	600
Selsey Rowan 4th	Nicholas, M. A.	11 7	Jersey	600

Quarterly Analysis, Standard Herd Test Report, 1952–53.

Quarter.	Breed.	Junior 2-year-old.		Senior 2-year-old.		Junior 3-year-old.		Senior 3-year-old.		Junior 4-year-old.		Senior 4-year-old.		Mature.		Breed Average.	
		No.	Average Butterfat.	No.	Average Butterfat.	No.	Average Butterfat.	No.	Average Butterfat.	No.	Average Butterfat.	No.	Average Butterfat.	No.	Average Butterfat.	No.	Average Butterfat.
			lb.		lb.		lb.		lb.		lb.		lb.		lb.		lb.
September	Jersey	308	262	69	271	186	288	56	307	142	324	31	323	442	336	1,234	304
December		86	239	42	265	46	304	32	259	44	311	28	314	181	323	459	294
March		138	256	70	271	53	305	81	315	45	333	76	327	243	338	706	309
June		918	273	364	308	322	328	296	337	253	327	230	358	1,161	351	3,544	320
Total		1,450	267	545	295	607	304	465	324	484	325	365	343	2,027	344	5,943	313
September	Dairy Shorthorn	28	193	9	252	23	233	11	258	19	244	14	256	64	290	168	254
December		13	206	6	209	9	202	11	234	14	228	3	266	32	250	88	231
March		10	179	16	215	3	223	15	255	4	250	14	252	38	286	100	251
June		40	207	36	228	30	228	31	259	19	255	29	252	133	309	318	266
Total		91	200	67	226	65	226	68	254	56	244	60	254	267	294	674	257
September	Guernsey	49	244	16	268	29	297	12	292	17	290	9	363	48	312	180	286
December		17	265	5	273	9	282	6	237	8	301	5	343	28	330	78	298
March		9	267	11	254	8	294	4	283	5	323	2	233	28	343	67	304
June		64	268	34	301	28	275	33	320	12	327	26	300	99	335	296	306
Total		139	259	66	283	74	286	55	302	42	307	42	316	203	330	621	299
September	Friesian	26	242	7	258	15	299	11	330	16	311	8	332	44	322	127	299
December		16	250	8	254	11	250	11	254	9	289	2	295	27	290	84	269
March		16	275	8	281	18	280	15	291	7	281	5	323	25	328	94	296
June		45	254	19	304	14	302	24	337	16	304	16	338	62	356	196	316
Total		103	254	42	282	58	285	61	310	48	300	31	331	158	331	501	301
September	Ayrshire	42	186	11	213	26	194	7	226	16	226	4	216	36	252	142	214
December		8	124	5	154	8	147	3	233	11	209	3	299	24	264	62	212
March		15	262	13	250	16	206	14	214	8	269	9	203	36	284	111	248
June		58	228	21	251	24	259	19	266	12	287	14	245	54	283	202	262
Total		123	211	50	233	74	211	43	240	47	245	30	234	150	273	517	238
September	Red Poll	4	226	6	233	6	296	8	312	..	..	5	300	29	327	58	303
December		1	223	2	219	1	270	4	311	..	..	3	312	10	271	21	277
March		6	210	5	247	4	201	1	345	2	128	4	242	29	281	51	256
June		7	252	8	315	10	250	5	294	7	304	8	306	58	295	103	291
Total		18	231	21	266	21	255	18	308	9	265	20	293	126	297	233	285
September	Australian Illawarra Shorthorn	32	205	9	235	13	223	5	217	16	238	4	238	18	269	97	229
December		10	200	1	90	10	264	6	259	3	191	6	246	21	300	57	256
March		11	202	10	252	2	224	12	247	3	268	9	292	29	293	76	264
June		39	237	17	250	20	234	21	247	7	249	8	244	55	295	167	259
Total		92	218	37	243	45	237	44	245	29	239	27	259	123	291	397	252
September	All Breeds	489	244	127	259	298	274	110	294	226	301	75	304	681	323	2,006	288
December		151	232	69	247	94	268	73	255	89	278	50	304	323	306	849	276
March		205	251	133	259	104	276	142	290	74	308	119	302	428	322	1,205	292
June		1,171	266	499	298	448	297	429	322	326	318	331	332	1,622	340	4,826	310
Total		2,016	257	828	281	944	285	754	305	715	307	575	320	3,054	330	8,886	300

	Butterfat. lb.		Butterfat. lb.		Butterfat. lb.
2,844 Two-year-olds averaged ..	264	1,698 Three-year-olds averaged ..	294	1,290 Four-year-olds averaged ..	312

Accredited Brucellosis-free Herds (Swine)

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-annual or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If, at a re-test, any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Name.	Address.
Adams, K.	Langwarrin
Anderson, N. A.	Foster
Anderson, W. H. and C. H.	"Merrileugh," Inverloch
Andrea, E. L.	Bittern-road, Red Hill
Andrew, A. E.	"Winslade," Whittlesea
Atkinson-Grimshaw, R.	Colac
Baker, J. J.	Bannockburn
Barclay, T. H.	Tyabb
Barr, H. M. B.	McMillans, via Cohuna
Barrow, J.	Bena
Batten, R. L.	Wallan-road, Whittlesea
Bidgood Bros.	Wodonga
Bodey, A. A.	Dooen
Bourke, J. F.	Bacchus Marsh
Bruce, J. E.	Narre Warren
Butler, J. H.	Newstead
Cardwell, S. R.	Eskdale
Castle, L. H.	Bena
Cattanach, A. H.	Whittlesea
Chard, F. J., and Son	Terang
Churchill, Stanley	Woolamai
Clark, P. W., and Son	"Coodardy," Whittlesea
Clemann, A. J.	Mirboo North
Cockbill, W.	Rockbank
Coleman Bros.	Cohuna
Coulthard, J. J.	"Walamba," Whittlesea
Craig, W. S.	"Drumclog," via Kerang
Dookie Agricultural College	Dookie
Dougall, J. K.	Hastings
Dowie, Alexander	Portarlington
Dowie, G. R.	Portarlington
Fairchild and Clutterbuck	Tinamba
Gardiner, J. M.	Phillip Island
Hamblin, A. T.	Toolleen
Hamblin, J. T.	Toolleen
Hamblin, N.	Toolleen
Harris, A.	Somerville
Harrison, C. T.	"Eastside," Pomborneit
Hawtin, I. E. and F.	"Rossmoyne," Colac
Hawtin, F. W. and O. M.	Bena
Haywood, Dr. A. R.	Hastings
Hogan, M. L.	Binginwarri
Hodgins, A. T.	Tyabb
James, W. E.	Whittlesea
Kelly, F. J. R.	Arawata
Kerger, A. C.	Marshall
Longerenong College	Dooen
Marshman, A. D.	Archie's Creek
Menzies, D. I.	Shoreham
Miller, A. J.	"Glenvale," Whittlesea
Mills, R.	Katamatite
Myers, F. P.	Bittern
McArthur, M. H.	"Melrose Farm," Wollert
McPhee, J. C.	Whittlesea
Noble, T. M. and Sons	Maffra
Northey and Co.	Koorilla Park, via Bethanga
Osborne, L. R.	Strathfieldsaye, via Bendigo
Randall, G. L.	Cohuna
Richards, Albert H.	Dunbalk, via Meeniyan
Rodda, N. J., and Son	Frankston
Roy, W. A.	Morrell's Hill, via Boolarra
Russell, J. A. and A. D.	Hendersyde, via Tatura
Rutherglen Research Station	Rutherglen
Salvation Army Boys' Home Farm	The Basin, via Bayswater
Taylor, B. Hogan	Wandeen Farm, Harkaway
Tharratt, H. E.	Red Hill South
Treacy, J. E.	Gunbower
Trenery and Soderland	"Promview," Foster
Toner, C. J.	Barwidgee Creek, Myrtleford
Turnbull, A. and Sons	Echuca
Twaits, D. G.	Emerald
Unthank, J. E.	Hastings
Watson, C. E.	Dewars-rd., New Gisborne
Whelpton, B.	Whittlesea North
Whytecross, D. J., junr.	Swan Marsh
Williams, Geo.	Paternoster-road, Emerald
Wilson, W. F.	"Esselment" Arawata

The JOURNAL of the Department of Agriculture

VICTORIA AUSTRALIA

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NOVEMBER, 1953

Issued by direction of the Minister of Agriculture, The Hon. C. P. Stoneham, M.L.A.

Editor: V. C. G. Lewis

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Photograph on Front Cover—
Roadside Dairy Farm, South Morang (Vic.)

5244/53.

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By J. A. MORROW, B.Agr.Sc., Senior District Agricultural Officer

The attitude of many farmers to fodder conservation is changing, and most stock owners now realize that an unfailing supply of fodder is essential if production is to be maintained with any degree of certainty.

Pasture improvement has greatly increased stock-carrying capacity, but has also increased the risks attendant upon poor seasons. Differences in seasonal growth have been accentuated and, when drought occurs, the normally highly-productive improved pastures are reduced to a level comparable with unimproved pastures.

In Victoria, growth occurs mainly in the spring months, and in the other seasons, or when drought occurs, paddock feed is generally insufficient to meet the needs of the increased stock numbers made possible by pasture improvement. It is essential therefore that provision be made for stock, not only for those parts of the year when growth is relatively weak, but also for the lean years where even spring growth fails to meet requirements.

Farmers have realised this, and fodder conservation on many farms is becoming as much a part of farm routine as topdressing or shearing. Since the 1944-45 drought, there has been an unbroken succession of good seasons in this State, and it would perhaps have been understandable if farmers had developed a sense of security and relied on a continuation of their good fortune. This did not happen, however, for until the 1951 season, the production of meadow hay remained fairly constant at about 400,000 tons; then, coinciding with a conservation campaign initiated by the Department of Agriculture, production increased in 1951-52 to 605,110 tons.

SPECTACULAR INCREASE IN FODDER CONSERVED

LAST season, an all-time record of 786,418 tons of meadow hay was conserved. This spectacular increase, obtained under adverse weather conditions, is an indication of the growing realization by farmers of the necessity for greater fodder reserves and of the fact that farmers wish to avert, if possible, a recurrence of the calamitous losses suffered in the 1944–45 drought. However, for complete safety, even greater conservation is necessary.

Farmers are fortunate in that the present season affords a further opportunity for large-scale meadow-hay conservation.

BENEFITS OF MEADOW HAY CONSERVATION

Meadow hay conservation is an economical method of providing a continuous supply of fodder to live stock; but it does more than that: it makes possible the carrying of more stock with greater safety, and benefits the health of the stock by helping to balance the diet. Supplementary feeding in the autumn will enable the stock to enter the winter in better condition and, by reducing the strain on the autumn growth, will permit better establishment of the pastures, with consequent improvement in weed control and later grazing.

The success of a fodder conservation programme depends to a large degree on the judgment of the farmer and the quality of his farm management. The first essential, of course, is to grow the material to be conserved, and, unless species suitable for the district have been established, adequately fertilized and rationally managed, the prospects of economical conservation of high-quality hay are generally very limited.

INFLUENCE ON SOIL FERTILITY

Under proper pasture management and with adequate fodder reserves, soil fertility will be improved as a result of the extra live stock carried; but, without proper management, there is a danger that some paddocks will deteriorate following the transference of fertility to other portions of the farm. This frequently results when the same area is cut for hay each season and the produce fed out in other paddocks. A common cause of deterioration is the development of potash deficiency, usually indicated by a weakening and reduction of the amount of clover in the pasture. This can generally be avoided if different paddocks are cut in successive years. Where it is practicable, it is desirable to feed out the hay in the paddock from which it was cut.

WHEN TO CLOSE PADDOCKS AGAINST STOCK

Having decided to conserve meadow hay, the decision as to which paddocks should be reserved should be made early, giving ample time for the pasture to be well enough

The pick-up baler has made large-scale meadow-hay conservation possible.

Baled hay should be carted in and stacked as soon as practicable. Rain damage or over exposure to sunlight can be very costly. This heavy crop was harvested in the Colac district.

advanced for economical handling of the hay early in the season. The time for closing paddocks from stock will vary from district to district, on the season and on the management of the pastures. Where ample conserved fodder is available from the previous season, early closing can be facilitated by feeding it out until pasture growth is sufficient.

Where winter conditions have not been favourable for growth and where supplementary feeding has not been practicable, it may be necessary to defer closing a paddock until spring growth is well advanced. It is seldom desirable to sacrifice the condition of the stock to provide the means of building it up again later on; but, as a general rule, paddocks should be reserved as early as the improved growth on the remainder of the farm permits. Paddocks cut for hay or silage in the previous year should not be cut again in the following season.

WORK PRELIMINARY TO HARVESTING OPERATIONS

Paddocks reserved for haymaking should be harrowed to spread manure and to promote even growth. Pieces of baling wire should not be left lying around and sticks, stones or other obstructions which may interfere with mowing should be removed. These could easily cause serious breakdowns and delays in the harvesting operations. All harvesting equipment should be checked, adjustments made and spare parts ordered. With machinery and paddocks in good condition for harvesting operations, the prospects for obtaining a maximum quantity of good-quality meadow hay will be greatly improved.

QUALITY IN THE HAY

For live stock, the feeding value of fodder is of great importance, and it is this aspect which often receives too little consideration. It is not always understood that the conservation of a large quantity of hay does not necessarily mean that reserves are adequate. Badly made hay may have a feeding value inferior to poor types of roughage. On the other hand, well-made hay may be almost equal in food value to concentrates. The objective should be the production of as much good quality hay as the conditions will permit.

Many of the factors influencing quality are outside the farmer's control; but, if every effort is made to reduce the effects of these to a minimum, considerable improvement in the value of our fodder reserves could be achieved. To obtain best results, a great deal of judgment is necessary at all stages. Variability in the composition and maturity of the pasture, weather conditions and equipment make it impossible to set out any hard and fast formula for making good hay. Each farmer must acquire the art through experience in his own conditions. There are, however, a few essential factors which, if given proper attention, could result in much improvement. These are—

1. Time of cutting.
2. Rapid even drying.
3. Prevention of damage by exposure or leaching.
4. Prevention of heating or development of moulds.
5. Prevention of mechanical losses.
6. Protection.

Time of Cutting

As pasture plants mature, there is a relatively rapid fall in feeding value, and farmers who delay cutting in order to obtain maximum yields often do so at too great expense of quality. A generally accepted compromise between yield per acre and quality of the hay is achieved by cutting the pasture when the main species begin to flower. While this can be accepted as a general rule, there are many circumstances under which it is not practicable or even desirable.

Tractor-propelled hayrake conveying hay to the press.

Weather conditions which would interfere seriously with curing and subsequent operations could cause unavoidable delays and, even if weather conditions are favourable, the necessity for maintaining a proper balance between cutting, curing, and baling, needs careful consideration. The advantages gained by early cutting can easily be lost if the cut pasture is left exposed to sun and weather while awaiting the arrival of the baler or other equipment.

Any organization of the harvest programme which will ensure that the equipment is in good working order, and ready for use immediately it is required, will reduce this risk and often allow an earlier start to be made. Where contract balers are used, it is seldom possible to arrange for the baler to arrive at precisely the right moment. It is desirable, therefore, to arrange cutting to fit in with the movements of the contractor. This will

★

A bale-loader is useful where large-scale conservation is practised.

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Hay should be placed under cover as soon as possible after pressing.

★

require judgment and a certain amount of luck. Breakdowns and weather conditions are unpredictable.

The composition of the pasture may also warrant some deviation from the general rule. Clover is usually the most nutritious constituent of the pasture, and frequently continues to grow for some time after the grasses have flowered. If the percentage of clover in the pasture is high, it may be desirable to sacrifice some of the quality of the grasses in order to obtain a higher yield of the more nutritious species. Clover pastures should be cut before they "sag" or sink back to the ground.

Rapid and Even Drying

The objective should be to dry out the grasses and clovers as quickly as possible so that they can be baled without risk of heating or of moulds developing. A moisture content of between 15 and 20 per cent. is safe, but the assessment of this in the field requires considerable judgment.

The leaves normally dry more quickly than the stems, and the clovers more quickly than the grasses, and this factor can sometimes be used in a rough test to determine whether the hay is ready for baling. When the nodes or "knees" of the grasses have shrivelled, it is generally safe to commence baling or carting in. Another rough test is to twist a handful of hay strongly with the hands, and if no moisture can be squeezed out the hay is ready. In selecting hay on which to make these tests, the sample should be taken from the dampest part of the cut material.

Exposure of hay to the weather during the curing process cannot be avoided, and during this period it may be damaged through various causes. The most obvious of these is rain, which may cause leaching of the soluble nutrients and, if excessive, may reduce the feeding value to the level of low-quality roughage.

There are many differences of opinion regarding methods of handling hay to reduce rain damage. Some claim that the hay will dry out more quickly and evenly if left in the swath as it falls from the mower. Others prefer to rake the hay into windrows. Here, again, there is a difference of opinion as to whether the windrows should be turned following rain or left untouched.

Where the crop is reasonable heavy it is commonly picked up by the baler direct from the swath and, provided that it can

be baled before the second or third rain falls, the method is probably satisfactory. If, however, it is subjected to a succession of showers, the prospects of baling good-quality hay will be greatly reduced. Moreover, hay which has had several wettings in the swath may become very difficult to pick up cleanly with the baler or sweep.

In windrows, it is sometimes claimed that, by leaving the hay untouched, the rain damage is limited to the surface. This is possibly the case when only light rain has fallen, but when the rain has been considerable, or where the windrows are large, there is a possibility of additional damage through heating.

Probably the safest method of reducing rain damage is to windrow the hay and turn it with the rake if rain falls before it is ready for baling. It is anticipated that further information on this important point will be obtained from extensive fodder conservation projects initiated this season by the Department of Agriculture in connection with a Commonwealth Extension Services Grant.

Damage of Fodder by Exposure to Sunlight

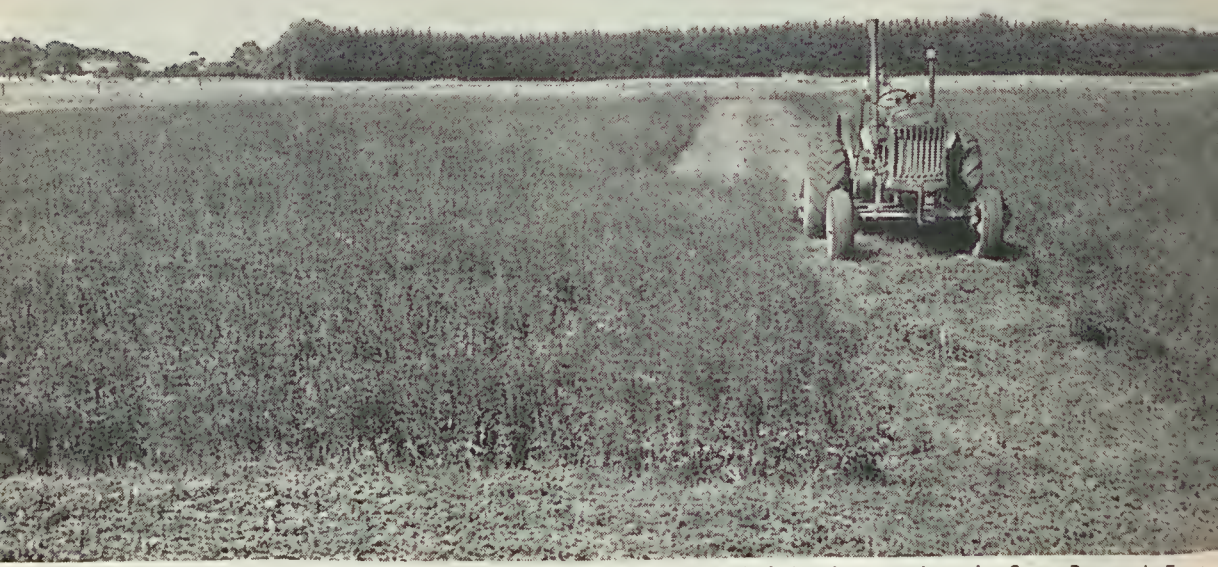
In addition to risk of damage by rain, meadow hay is adversely affected by exposure to the sun, which reduces the amount of digestible protein. In windrows, the amount of hay directly exposed to the sun is reduced and, if the hay can be dried rapidly and baled early, more of its original feed value will be retained.

Prevention of Heating and Development of Moulds

The development of heat or moulds is an indication that the hay has been stacked or baled before it was properly cured. Damp hay should never be baled or stacked; otherwise heated or mouldy hay may result, and there is a possibility that the stack will catch fire. If there is any doubt about the curing, it is advisable to defer baling, even if it means risking a fall of rain. If circumstances make it necessary to bale hay of doubtful dryness, the bales should be left in small heaps for a few days rather than stacked immediately. By doing this, any damp bales will have a better chance of drying out or cooling down.

Prevention of Mechanical Losses

The nutritive value of meadow hay is mainly in the leaves, and retention of the leaves is an important consideration in the production of good quality hay. By over-exposure and allowing the hay to become too dry, the leaves become brittle and shatter



Lucerne should be cut for hay when flowering commences. This crop is being harvested at the State Research Farm, Werribee.

A well-constructed shed provides ideal protection for hay. Waste in an unprotected stack (lower) can be very costly.

easily. Losses can be reduced by avoiding raking or handling the hay during the hotter parts of the day. Baling as soon as the hay is ready will save much of the leaves.

Protection

Well made hay is a valuable asset, but it will not remain valuable for long unless it is given effective protection from the weather. Baled hay is particularly vulnerable to weather damage, and any effort made to give it adequate protection will be amply repaid. The ideal protection is a shed but if there is insufficient shed room available and stacks are built these should be covered. There are many methods of covering stacks—by the use of sections of iron or boards, thatching, tarpaulins (or other prepared coverings) and these can be used effectively. If none is available, the stack should be liberally capped with loose hay, which is best lightly raked to help turn the rain, and held in position with wires or netting. Plans of a method of stacking baled hay are available on application to the Department of Agriculture. From the foregoing it may be understood that the making of good quality hay depends to a large degree on the farmer's capacity to adapt his methods to meet conditions beyond his control.

Usually, weather conditions are good enough to produce high-quality hay provided that sufficient care is taken and all operations carried out without delay at the proper stage. There are many occasions, however, particularly in the early part of the season, when uncertain weather conditions make haymaking hazardous. By arranging early hay cutting and being in a position to change over to silage-making in the event of unsettled weather occurring, it is possible to avoid some of the interruptions and conserve good quality fodder. Silage has a useful place on most farms and, since it can be made almost independently of weather conditions, it can aid materially any efforts to conserve the pasture at its most nutritious stage.

OTHER METHODS OF CONSERVATION

In overseas countries where the more-or-less regular incidence of unsatisfactory harvesting weather seriously affects haymaking, much consideration has been given to the development of alternative means of fodder conservation. The introduction of "field choppers" and various types of drying equipment has resulted in the assured production of fodder with improved feeding value. Such equipment is fairly costly, and under present Victorian conditions the purchase of special drying equipment would be uneconomic on the average farm.

An experimental grass dryer has been installed at the State Research Farm, Werribee, and information on this process will be obtained under Victorian conditions.

However, ordinary haymaking methods can give satisfactory results, and widespread use of methods involving costly plant is not likely to be undertaken in the immediate future.

SUMMARY

There has been a spectacular increase in Victorian meadow hay production—but much greater reserves are needed.

To obtain the best hay:

1. Cut the pasture as early as practicable.
2. Cure it well.
3. Do not bale or stack the cut material if there is any risk of heating or of moulds developing.
4. Do not leave the fodder exposed to the weather any longer than is necessary.
5. Make sure that the stacked hay is effectively protected.

Books Reviewed

Feeding Farm Animals—Published by Angus & Robertson, Ltd., Sydney—Price 45s.

In his book "Feeding Farm Animals," A. C. T. Hewitt has shown in characteristic style his ability to deal with the subject. The manner in which science is blended with practice should give the book a wide appeal to farmers, tutors and students. The numerous designs, graphs, and tables are excellent adjuncts to the general text.

The marked influence of an abundant supply of clean drinking water on body growth and assimilation of food will come as a surprise to many farmers. The average daily water requirements of stock, the functions of water, how to keep it clean and how to estimate the capacity of storages are all dealt with.

Organic foods such as carbohydrates, fats and proteins are fully dealt with in conjunction with vitamins and anti-biotics. The information is applicable to all farm animals and the system of reducing feeds to a food unit basis is explained in order to enable comparisons to be made. A short concise chapter on digestion and utilization of food by animals is a valuable section to the book. Two chapters are given over to pastures, shrubs, trees and cultivated crops and by-products. Included also is a complete table of analysis of all common stock foods.

[MARTIN D. HALL.]

Australian Plants for the Garden—By Thistle Y. Harris, B.Sc.

(Angus and Robertson, 354 pp., 63s.)

Apart from very brief references in various books on Australian native plants, this is the first book, other than a few small pamphlets of limited range, which has dealt in a comprehensive way with the possibilities of Australian flora for gardens.

The author is well known for her previous work on Wild Flowers of Australia, and is an acknowledged authority on native plants. In her latest book which is profusely illustrated in half-tone and coloured plates, she covers the whole field from propagation to planning the lay-out of gardens planted exclusively with native species. There are also many photographs of gardens which have effectively used native plants in many ways.

The list of species that would make fine garden subjects is large and comprehensive for small and large gardens, hedges and windbreaks, bog, rock-wall gardens, and even for window boxes or tubs. There is a section on trees for parks, avenues, or large gardens.

The section on propagation should be particularly useful for those who find it difficult to purchase some of the decorative species they may come across in the bush or in other gardens and this should be of much assistance to nurserymen who wish to meet the growing demand for Australian plants, due to the realization that there are few exotic species which will thrive so well in gardens where facilities for watering are restricted.

[G. N. HYAM.]

APPLE GROWING IN VICTORIA

By G. W. Gayford, B.Agr.Sc., Senior Horticultural Instructor

AS apples can be kept for fairly long periods in cool storage, they are available for at least eleven months of the year. From the consumer's viewpoint they are the most popular of all fruits.

The unfortunate period during the nineteen thirties when overseas markets were unprofitable, followed by a complete cessation of exports during the war years, caused many growers to become disheartened, and there was a decline in total acreage from 31,000 acres in 1930, to 22,000 acres in 1944.

It is difficult to forecast what the future holds for apple growing, but, with the possibility of overseas markets again opening up for Victorian fruit, there may be room for a slight increase in plantings in suitable districts. The main outlet for apples is the home market, which has proved very profitable over the past eight years, particularly for growers with cool-storage facilities and who are situated conveniently to the main Melbourne market, and are able to supply retailers with fruit for eight or nine months of the year.

The average apple crop in Victoria has yielded in the vicinity of 1,800,000 bushels annually, with a variation of from under 1,000,000 bushels in a light year to 3,000,000 bushels in a heavy year. The main characteristics of the various districts are as follows :—

Metropolitan

The metropolitan area includes the districts within an arc from north-east to south-east of Melbourne with a radius of 30 miles. It includes the largest concentrated area of apple orchards in Victoria, the average annual production during the past ten years being 570,000 bushels. The main centres are Hurstbridge, Diamond Creek, Templestowe, Doncaster, Blackburn, Ringwood, Croydon, Wandin, Bayswater, Wantirna, and Glen Waverley.

The method of marketing, in which growers have a space allotted to them at the Victoria Market and are able to sell their own fruit, has been very satisfactory for metropolitan growers.

The soils are silurian clay loams of moderate fertility, and for best results regular fertilizer applications, which include sulphate of ammonia and potash, are required. Poultry and stable manure are also used when available and green-manure crops are sown in suitable seasons. Underground drainage is required. Severe frosts are rare, while the average rainfall varies from 28 to 30 inches per annum. Many properties are connected to the water-supply system of the Melbourne and Metropolitan Board of Works. In addition, most growers have water-storage dams varying in size from 200,000 to 3,000,000 gallons. Water is used as a subsidiary to natural rainfall and is applied to trees only during the dry periods in the summer.

Main varieties grown in the area are Alfriston, Twenty Ounce, William's Favourite, and Gravenstein for early market; Stewarts' (Ballarat) Delicious, Jonathan, Granny Smith, and Statesman for mid-season market and storage; and Yates, Rome Beauty, Democrat, and Rokewood for storage and late local and interstate market. A feature of the area is the large co-operative cool stores in which many growers rent space for their fruit. In addition there is a large number of private stores, the owners of which frequently buy-in fruit from outlying districts in light seasons.

Mornington Peninsula

The average apple production on the Mornington Peninsula is 400,000 bushels per annum. The district is non-irrigated, and the soils are chiefly sandy loams of recent origin. In the Red Hill district, there is an area of red basaltic soil on which high-quality fruit is produced. Most of the apples from this area are sold on the Melbourne and interstate market, and, before the war, the district was important in the export trade. The main centres are Somerville, Mooroodue, Tyabb, Hastings, and Red Hill.

A similar range of varieties to those in the metropolitan area is grown with slightly more emphasis on the mid-season types.

Gippsland

An important apple district is situated along the main Gippsland railway line from Narre Warren to Warragul with the main centres of production at Beaconsfield, Officer, Pakenham, Garfield, and Bunyip. The soils are mainly granitic sandy loams and silurian clay loams. The rainfall varies from 35 to 45 inches per annum and irrigation is not required.

The district provided an important contribution to interstate and export markets for apples before the war. Varieties grown are similar to those for the metropolitan area but a bigger proportion of Yates is grown for interstate markets. The average production for the district is 250,000 bushels.

Orchard country in the Doncaster district.

Apple orchards in the Stanley district, North-eastern Victoria

Harcourt-Bendigo

Harcourt is the main apple-growing centre north of the Divide. The soils are granitic, while the average rainfall is 22 inches. Late frosts occasionally cause some damage in this area which is over 1,000 feet above sea level. Water for irrigation purposes is supplied to most properties from the Coliban system. The fruit is handled by central packing sheds and cool stores at Harcourt for local, export and interstate markets. Varieties include Jonathan, Granny Smith, Delicious, Statesman, Dunn's, London Pippin, Ballarat, Rome Beauty, Stone Pippin, Cleopatra. Average production of this district is 350,000 bushels per annum.

Geelong and Bacchus Marsh

Small areas are grown in the vicinity of Geelong, mainly for the local market. The orchards are non-irrigated. Varieties are similar to those grown in the metropolitan area. There are also some orchards under irrigation in the Bacchus Marsh area on deep rich alluvial soils. The average production for the area is 130,000 bushels annually.

Western Victoria

Small areas of apples are grown in Western Victoria. At Quantong, the orchards are grown mainly under irrigation, water being supplied from the Wimmera River system. The climate here is rather hot and dry for apples but the varieties Granny Smith and Cleopatra are produced and are of a fair quality. The districts of Pomonal, Amphitheatre, and Portland also produce small quantities, with the average annual production for the area about 70,000 bushels. Most of the fruit is sold within the area but export was a feature in pre-war years.

North-East

The old gold-mining town of Stanley is now a centre of apple production and there are other isolated orchards in the same area within a radius of twenty miles. Average

production is 80,000 bushels per annum. The soils are red silty loams of ordovician origin and appear to be well drained. The rainfall is in the vicinity of 40 to 45 inches per annum. In seasons of high spring and summer rainfall black-spot control presents a problem. All the main mid-season varieties are grown for marketing in the Riverina and Melbourne. The variety, King Cole, a Jonathan seedling of excellent colour and keeping qualities, grows very well in this area.

Goulburn Valley

The Goulburn Valley district is of minor importance for apple growing largely because the summer climate and heavy soils are not well suited to this fruit. There are some growers who are now considering apples as an alternative to pears for replacement on old peach blocks. Varieties such as Delicious and Granny Smith seem to be best suited for these conditions.

Rootstocks

In Victoria, the Northern Spy is used almost universally as the rootstock for apples because of its resistance to woolly aphis. Under conditions of poor soil drainage this rootstock is not always satisfactory. The Granny Smith on Northern Spy does not always make a good tree, and, under certain soil conditions, an uneven growth is produced. Granny Smith trees on seedling stocks appear to make better growth. Until further information is available from the results of rootstock trials at Scoresby Horticultural Research Station, it is not possible to recommend any changes in present rootstocks.

Soils

Apples are grown on a fairly wide range of soils throughout the State, as indicated in the sections dealing with various districts. The most suitable apple soils appear to be silty loam soils with an underlying friable clay. Trees grown on deep fertile soils take too long to settle into bearing.

Varieties

Early.—Alfriston and Twenty Ounce are grown to a limited extent for early local marketing as culinary varieties. William's Favourite is a coloured dessert apple grown for early market. Gravenstein is the most popular early dessert variety, and various strains have been developed with improved colour. This variety suffers from a distortion or "gnarl" of the trunk which restricts growth and for which no effective control can be suggested at present.

Mid-season.—The most popular mid-season varieties are Jonathan, Granny Smith, and Delicious. The Jonathan is the most popular variety in all districts with the Granny Smith variety next in popularity. Statesman and Red Statesman or Warrior are also grown fairly widely for late storage. London Pippin and Rome Beauty are grown on a large area but are now generally being superseded by high-quality varieties. Cleopatra and Dunn's are grown mainly in the Western district. The green culinary variety, Stewart's or Ballarat, is popular on the local market. The varieties, Crofton, Rokewood, Democrat, and Yates, are late varieties grown for storage and late markets.

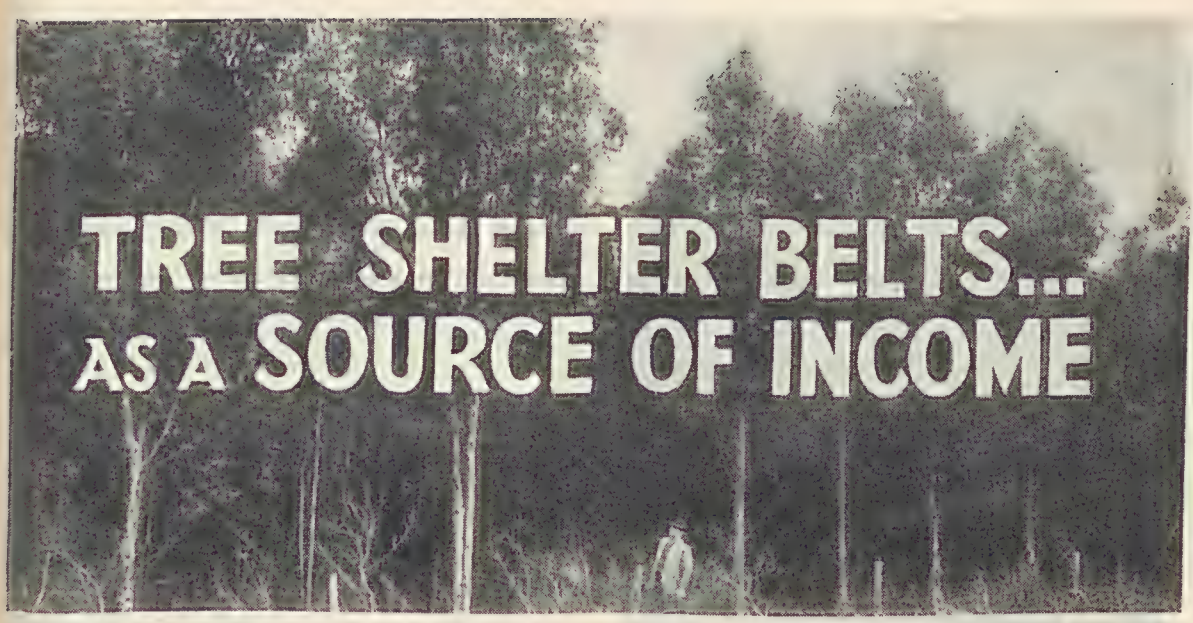
Pollination

There is need for provision of cross pollination in all apple orchards and this is particularly evident in years when weather is cool and showery during the blossoming period. Alternate double rows of two different varieties blossoming at the same time will provide good pollination. For planting a larger proportion for a main variety, a pollenizer could be planted every third tree in every third row.

For solid block planting which may be desirable in some circumstances, a pollenizer scion may be grafted in each tree just before it comes into bearing. Rokewood grafts in Jonathan trees are effective for this purpose, and sometimes growers remove any Rokewood fruit that sets to ensure a good blossoming each year. Most apple varieties are cross compatible. Gravenstein is a triploid and cannot be used as a pollenizer for other varieties but bears satisfactorily when planted adjacent to several other varieties. Statesman and Delicious are slightly later than the main mid-season varieties in some years. London Pippin and Rome Beauty are usually ten to twelve days later than other varieties in blossoming and should be planted together for pollination.

Apple trees should not be planted less then 18 feet apart even on poor soils. On deeper soils the distance could be increased to 20 or 22 feet apart while, for varieties such as Yates and Gravenstein which produce large trees, 24 feet apart would be suitable.

Further information on planting out, training young trees, fertilizers, pollination, and pest control, is included in separate leaflets available on application to the Director, Department of Agriculture, Melbourne, C.2.



TREE SHELTER BELTS... AS A SOURCE OF INCOME

By W. E. HILLIS, M.Sc., Division of Forest Products, C.S.I.R.O.

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Progressive farmers are well aware of the value of maintaining adequate shelter belts and windbreaks, especially in windswept districts. The normal advantages of shelter belts are the protection given to stock, field crops, orchards and buildings, the provision of fuel, the checking of wind erosion and beautifying the area. These, alone, repay the expense of planting and if, in addition, farmers choose tan-bearing trees they can add to their income with the sale of the bark.

ALTHOUGH fuel and timber are a logical use for a tree, the value of the barks of many trees as a source of tannin has been overlooked. Large amounts of wattle bark have been collected in the past, but there has been serious depletion of natural stands of wattle trees, and attempts to establish large plantations of wattle here have been hindered by the high labour cost.

Since the war, the position regarding the supply of tanning extracts has become the concern of all countries with large farming communities.

World supplies of tannin-bearing materials are inadequate, and these supplies are diminishing. Therefore, unless corrective measures are undertaken, the position will become increasingly serious in the next ten or twenty years and most critical in about 50 years. More than 300,000 tons of tanning materials per annum will be needed to replace those materials whose sources are rapidly diminishing. Some countries are endeavouring to establish wattle plantations in order to supplement existing supplies. However, it will not be possible to overcome the shortage completely in this manner as the first priority for land is for food production. In addition, wattle plantations require a high minimum rainfall depending on local conditions, and good soil.

The prices of tanning extracts have risen very sharply since the war and these prices are causing serious concern. Large and varying proportions (about 40 per cent.) of vegetable tannins are taken up by a hide in the formation of leather. Consequently increased tannin costs must influence the price of leather. Substances such as rubber

A plot of Brown Mallet *(Eucalypt astringens)*, at the Victorian Forests Commission plantation in the You Yangs. These 12-years-old trees are 8 feet apart and 40 feet high.

and resin rubber, are beginning to offer competition to leather. These materials are more expensive but they are favoured by some as much more suitable for the modern mass production of footwear utilizing " stick on " methods. Such methods require strict standardization of materials, and leather, in common with any other natural product, varies from sample to sample. Thus we are faced with a situation where the natural material has a combination of superior properties but one superior property in the synthetic product may enable it to compete successfully with the natural product. If synthetics were able to displace leather to any appreciable extent, the income from sale of hides and skins would be reduced and the disposal of these products would present a serious problem.

Eucalypts as a Source of Tannin

For some time a tannin extract industry has been established in Western Australia, utilizing the bark and wood of two varieties of eucalypt known locally as the wandoos. Wattles therefore are not the only trees which will provide tanning materials.

The Division of Forest Products, C.S.I.R.O., is investigating the kinos or " gums " of eucalypts for the production of tannin, and farmers can help by growing tan-bearing trees in the shelter belts on their properties.

Suitable Types of Tree for a Shelter Belt

The effectiveness of a windbreak is appreciable to a distance of twenty times the height of the trees. A tree with a natural low-branching habit is most suitable, but as many of our larger native trees do not possess this characteristic the deficiency may be overcome by planting the trees close together in a belt half a chain wide. Alternatively, shrubby types of trees may be incorporated with the taller-growing species.

A number of native trees are eminently suitable for shelter belts as they are evergreens, thrive well in their natural habitat, and provide useful products. However, as far as possible, those trees whose barks are commonly used by tanners should be chosen, as tanners hesitate to begin to use a bark when regular supplies cannot be guaranteed. There is very little chance of over production of bark, as Victoria imported, during 1950–51, tannin extract equivalent to more than 8,000 tons of bark, and Australia more than 23,000 tons.

Brown Mallet, A Rich Tan-bearing Eucalypt

One eucalypt suitable for shelter belts is the Brown Mallet of Western Australia, which has the richest tan-bearing bark in the world. It grows in the 12 to 25 in. rainfall belt on the poorer class of country. The mature tree attains a height of up to 100 ft. with a clear straight bole up to 60 ft. and a breast-high diameter up to 30 in. Victorian plantation tests carried out at the You Yangs and at Lake Lonsdale near Stawell, show that mallet grows very well in this State. In both sample plots at the You Yangs, mallet has grown more vigorously than sugar gums planted at the same time.

A tree grown in a sample plot, at 17 years old, was 45 ft. high and yielded 80 lb. of dry bark. When planted at the rate of 300 trees to the acre (16 ft. apart) a yield of 11 tons of dry bark per acre would be obtained after 17 years growth.

This yield is higher than that obtained from natural plantations, as the mallet responds appreciably to cultivation and increased rainfall. Those trees on the edge of a plantation grow noticeably better than those in the rest of the plot. Consequently the thin strips of shelter belts seem to be an ideal way to grow mallet, and a greater yield of bark per acre could be obtained from such plots. The tannin content of the bark may reach 52 per cent., while the average shipments would contain 40 to 45 per cent.

Mallet also Produces Excellent Timber

In addition, mallet yields a valuable timber which is exceptionally strong and shock resistant. It makes excellent tool handles, and should prove to be a satisfactory substitute for hickory for all but the most exacting purposes.

Although untreated mallet is not a very satisfactory timber for fence posts, service tests over 20 years have shown that round mallet posts, treated with creosote or other preservative, can give excellent service comparable with those from high-durability timbers.

As mallet lacks lower branches, its effectiveness as a wind-break lessens as it grows. Unfortunately, wattle will not grow as a lower storey amongst eucalypts. Consequently, the best alternative is to plant the mallets close together (about 6 ft. apart) and to "thin" out the plot after about seven years. The crowns of the remaining trees then become larger and the bark thicker. Mallet seeds freely and, if every alternate 30 to 35 yards are cut out every 20 years or so, and seeds sown, the shelter belt will renew itself, providing continuous protection.

The method employed to grow Brown Mallet in Western Australia is to fell the scrub on the area selected and to burn it off with a hot fire in March, providing a good seed bed with plenty of ash. A few days later small areas 12 inches in diameter and at 6-ft. intervals are hoed and a pinch of seed is dropped on each. This seed is thinly covered and lightly compacted with the foot. Seed may be obtained from the Forests Department, Perth, Western Australia, at 10s. per oz (containing 5,000 seeds) with a 20 per cent. reduction for lots over 2 lb. In twelve months the seedlings are 12 inches high and 6 to 10 feet in three years. Stripping the bark of the grown trees is done in June to October. The bark should be stacked with the outer portion uppermost and in such a way that it will dry rapidly.

The Wattles

Wattles have a denser growth than the mallet and need wetter conditions. The black and golden wattles are the only ones satisfactory for tanning purposes. The black wattle grows to 35 feet in about nine years, on the lighter sandy and loamy soils of the foothills in the 20 to 40-in. rainfall belt. One tree yields about 30 to 40 lb. of dry bark containing 35 per cent. tannin, or about 5 tons of dry bark per acre after nine years.

The golden wattle grows 15 to 20 feet in about twelve years in the 15 to 40-in. rainfall belt. The bark contains

Brown Mallet, 15 years old, grown on poor soil. The trees are approximately 35 feet high.

about 35 per cent. tannin, and is said to strip about two tons of dry bark per acre after twelve years.

Other Tannin Producers

Trees of the goldfields area in Western Australia, also contain large amounts of tannin—the Dundas Mahogany, 40 per cent., the Dundas Blackbutt, 25 per cent. These trees have not been tried here in plantation tests yet but would probably do well in the dry regions of the State.

Farmers should consider both the wattles and the mallet before selecting the type of tree they wish to grow in their shelter belts. The wattles are well known in this State, but the lesser-known mallet offers particular promise—its yield per acre is slightly greater than that obtained from wattles and the bark contains more tannin.

Christmas Food Parcels for Britain

Orders for parcels of foodstuffs for Christmas delivery in the United Kingdom are still being received under the gift scheme conducted by the Victorian Department of Agriculture. Intending donors of food parcels should lodge their orders now to ensure delivery by Christmas, as the available supply of parcels cannot be repeated.

The parcel contains dried fruits, tinned meat, beef dripping, canned peaches, and cheese, and will be delivered to any address in England, Scotland, Wales, and Northern Ireland at a cost of 27s.

Orders should be forwarded to the Director of Agriculture, Treasury Gardens, Melbourne, C.2, accompanied by the necessary remittance and the names and addresses of the persons to whom the gifts are to be forwarded.

Books Reviewed

Science and the Glasshouse—(2nd Edition) by W. J. C. Lawrence—Published by Oliver and Boyd, Tweeddale Court, Edinburgh—175 pages, 15s. Sterling

This edition of Science and the Glasshouse has additional chapters not included in the first edition reviewed in this Journal in March, 1949. These include discussions on the effects of growing carnations under glass in loose or firm soil, data which may possibly be applicable to other plants; further evidence of the effects of morning and afternoon light and new figures showing the amount of sunlight and diffused light for each month of the year for English conditions. The whole volume, written by a foremost authority on glasshouse construction as a result of his work at the John Innes Horticultural Institution, embodies the latest information on problems relating to natural illumination by better glasshouse construction and orientation as well as much technical information on the preparation of soil composts and handling plants under glass in general.

Although written for Northern Hemisphere conditions, the information could be readily translated to our conditions with great benefit to nurserymen and others engaged in glasshouse construction and culture.

[G. N. Hyam.]

The John Innes Glasshouses—John Innes Leaflet No. 10—Published by Oliver and Boyd, Tweeddale Court, Edinburgh—1s. Sterling

The well-known English horticultural institution, the John Innes Horticultural Institution, was transferred from its original site at Merton to a larger property at Bradfordbury Herts. Opportunity was then taken to construct all the new glasshouses and nursery plant on the lines suggested by W. J. C. Lawrence's experiments as published in his book "Science and the Glasshouse." The 12-page booklet shows a plan of the general layout and specifications, together with photographs showing the external and internal features of the new glasshouses. The leaflet should be valuable to anyone wishing to build new nursery, propagating and other plant.

[G. N. Hyam.]

LIVE STOCK NOTES

Compiled by
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

DEEP LITTER IN PIG PENS

THE deep-litter system of housing pigs has recently received much publicity and has aroused the interest of pig raisers. The system has its place but it has its problems and its limitations and is not the solution to easy, profitable pig production that some people think it is. When feeding and housing conditions are suitable to the use of deep litter, intelligent management is necessary for its successful application. An adequate supply of food for pigs is still more important than the kind of accommodation they are given.

On an adequate diet, pigs can be raised successfully in paddocks with shelter sheds or intensively in small pens. Those pens may have concrete floors and little or no bedding material, or they may be provided with deep bedding (litter) of sawdust, shavings or straw.

When little or no bedding is used in intensive pens, they should be cleaned out frequently, probably daily. But if bedding is liberally provided and added to as required, it will, under favourable conditions, absorb the excreta and obviate the need for frequent cleaning. In its absorption of the excreta, it seems that the bedding is aided by microbes whose action on the litter and excreta produces heat and changes the texture of the bedding and excreta. That change is somewhat similar to that which occurs in a garden compost heap.

For the microbes to work efficiently in changing the material to a warm, crumbly mixture, there must be suitable proportions of litter and excreta and there must be a correct degree of moisture, and possibly the correct degree of acidity.

To control the moisture, it is necessary to have the pen completely roofed to keep rain out. Ground drainage must be diverted from the pen. Water troughs should be constructed in a manner to prevent water being spilled in the pen. When pigs are fed large quantities of liquid food such as skim milk, it will be difficult, if not impossible, to maintain a sufficiently dry litter for the microbes to work satisfactorily.

Some people add various forms of lime to the litter and claim it assists in maintaining the desired condition. Some believe the lime has the desired effect because it helps to dry the litter. Others believe the lime reduces the acidity in the litter to a degree favourable to the microbes.

After a period of months, the litter may extend to a depth of about 18 inches. That creates a problem of adjusting troughs. Movable troughs may be raised. Fixed troughs may be set 18 inches or more above the original floor level and two or more steps provided for the pigs to climb up.

Pigs kept in pens with adequate floor space, about 20 sq. ft. per bacon pig, follow their natural instincts of sleeping, eating, and excreting in three distinct parts of their pen.

When deep litter and infrequent cleaning of pens is practised as little as 10 sq. ft. of floor space per pig may be allowed. This may even be desirable so as to forestall the pigs in following their instinctive practices and force them to mix the litter and excreta together. Even with reduced floor space, it is usually necessary to stir the bedding to mix the very damp parts with

the very dry parts. Both concrete and earth floors have been used with deep litter in pig pens.

[L. A. Downey, H.D.A., Pig Expert.]

OPEN-RANGE FOR CHICKENS

Birds should be given a period of natural relaxation during rearing, to enable them to withstand the conditions encountered in commercial laying sheds during their productive years.

Free range is the nearest approach to natural conditions, and the benefits derived by poultry reared on range cannot be assessed in figures only. Apart from egg production and hatching results, there is the elusive physical factor which has an important bearing on the health of birds. It is this factor that makes some flocks more resistant to disease than others, and improves growth, production, and fecundity.

Success is usually the result of good management and careful planning, and it is certain that on every well-planned farm, ample provision is made for the rearing of young stock under natural conditions. Free-range provides freedom, fresh air, sunlight, fresh pasture, and minerals in natural form, all highly desirable factors for growing chicks.

Newcomers to the industry are inclined to think in terms of 2 to 3 acres for commercial poultry farming, rather than 5 to 10 acres. Lack of finance and a keen desire to make a start are influencing factors, but these should be suppressed until a more favourable position is reached and more knowledge gained, so that a common sense plan can be drawn up, which may involve additional finance but will have a better chance of success. Those who have the ability and financial resources to overcome the disadvantages of a restricted area have many more problems to overcome than the person who has ample space at his disposal for the rearing of chickens.

Small paddocks are quickly contaminated and the only sound method of disinfecting land is to rest it for at least twelve months. Disease organisms, worm eggs, and any other source of infection in soils can be destroyed only by exposure to weather for an extended period. This can be done only where alternate, or rotational paddocks are available.

The practice of building up resistance by exposing birds to disease organisms is a dangerous one, because the degree of physical fitness varies in different flocks.

Open-range chicken-rearing yards on a Lower Templestowe poultry farm.

Experience has shown that disease is more prevalent on farms where the space is limited, and only one paddock is used to rear all the young stock each year. Parasitical infections are less prevalent on farms where ample room is available for brooding and rearing young stock.

With the advent of laying cages there is a greater need for natural conditions during rearing, as the birds are destined to spend the rest of their lives under conditions that could be described as super-intensive.

[M. D. HALL, Poultry Expert.]

Saanen does housed for the night.

GOATS MILK WELL AT ROYAL SHOW

The eight does which competed in the 24-hours Milk Competition at the Melbourne Royal Show produced exceedingly well under the strange conditions obtaining at the Show Grounds. The winner, a Saanen, Glenroy Jennifer, produced 13.8 lb., and the lowest producer gave 9.6 lb., which is still a most creditable yield for an animal the size of a goat. For the past three years the competition has been won by a doe entered by Mr. and Mrs. C. J. Mackay, Glenroy. The second highest producer was the Toggenburg doe, Northmoor Valkyr, imported from England by Dr. C. E. Sandy, Essendon.

The production performances of the does in this test are set out in the table.

In these competitions which have now been running since the 1949 Show, the highest milk-producing doe has been St. Auburn Trudinka which produced 14.1 lb. for Mr. and Mrs. C. J. Mackay in 1951. The highest butterfat producing doe was Glenroy Judy, which produced 12·0 lb. of milk with 6.6 per cent. of butterfat and in 24 hours produced 0·79 lb. of butterfat. She was also owned by the Mackays. The highest-testing doe was Warrawee Queenie owned by Mr. and Mrs. O. Grayson. It produced 9.3 lb. of milk with 8·8 butterfat percentage in 1949.

In five Royal Show competitions, 33 does have averaged 9.7 lb. of milk. [A.C.T.H.]

BREEDS OF SHEEP IN VICTORIA

The number of sheep of all breeds grazed in Victoria on March, 31, 1953, was 21,313,685. The various breeds are shown in the table overleaf, prepared from information made available by the Victorian Government Statist.

MILK COMPETITION FOR GOATS — MELBOURNE ROYAL SHOW 1953

Name of Doe.	Name and Address of Breeder.	Total Milk.	Butter Fat.	Solids not Fat.
		lb.	%	%
(S) Glenroy Jennifer	Mr. and Mrs. C. J. MacKay, Glenroy	13·8	5·0	9·0
(T) Northmoor Valkyr	Dr. C. E. Sandy, Essendon	13·7	3·5	8·5
(S) Coolabah Calico	J. R. and G. C. Lynch, Pascoe Vale	11·9	5·5	9·5
(T) Shasta Marguerite	Mrs. A. M. Parratt, Kilsyth	11·4	4·1	8·9
(T) Shasta Dainty 2nd	Dr. C. E. Sandy	10·6	5·6	10·2
(S) Stonehill Scylla	J. R. and G. C. Lynch	10·2	5·5	9·2
(S) Eriskay Janna	Mrs. C. Fitzpatrick, Eltham	9·9	5·5	8·3
(S) Coolabah Clarabella	J. R. and G. C. Lynch	9·6	4·1	8·4

(S) denotes Saanen. (T) denotes Toggenburg.

The two districts in which most of the sheep of the particular breeds are found are also shown.

These divisions of the sheep indicate that 98·01 per cent. of sheep in Victoria are good wool producers. The other breeds include all the British breeds, most of which are kept for breeding rams to mate with wool-producing ewes for the production of fat lambs. [A.C.T.H.]

BEEF CARCASS APPRAISAL AT THE MELBOURNE ROYAL SHOW

In the fat cattle section at the Royal Show this year all bullocks entered except those in the pens of three grass-fed steers were slaughtered and their carcasses appraised. In the pens of three, the middle-weight steer was slaughtered and its carcass appraised. Greater interest was taken in these competitions and it was noticeable that grass-fed steers could not compete with those pushed along with concentrate feeding, since the grass-fed ones were deficient in eye muscle and much too long in the leg to score well.

In the development of an animal, bone grows first, then muscle, and lastly fat. Breeders find that for carcasses to score well in these competitions, calves must be fed heavily on muscle-building foods right from the commencement to arrest bone development (otherwise they will lose too many points for leg length) and to build up eye muscle. It is in the first 12 to 18 months that an animal can be heavily fed on protein-rich foods without becoming greatly over fat. After that the animal has reached the fattening stage, when heavy feeding leads to over-fattening even when protein-rich muscle-building foods are used.

Some of the exhibits this year were grossly overfat and three entries scored no points for fat depth, and two others scored one point only.

The breeds were well represented, and while Aberdeen Angus scored most points, Herefords scored better for those points allotted by eye judgment. Their rib-cover was nearly perfect. The Red Poll, Dairy Shorthorn, and Poll Hereford-Jersey cross steers had been bucket reared.

Seven carcasses lost points for being a little on the thin side of the ideal. In the following table they have been marked with an asterisk.

BREEDS OF SHEEP IN VICTORIA, MARCH 31, 1953

Breed.	Total Number.	Percentage of Total.	District with most Sheep of Respective Breeds.	District with Second Highest Numbers.
Merino	8,271,360	38·81	Western	Wimmera
Polwarth	994,523	4·67	Western	Central
Corriedale	3,800,620	17·83	Western	Northern
Total wool breeds	13,066,503	61·31	..	..
Merino—Comeback	2,251,027	10·56	Western	Northern
Crossbred	5,570,972	26·14	Northern	Central
Total Crossbreds	7,821,999	36·70	..	..
Romney Marsh	141,538	0·66	Western	Central
Dorset Horn	103,356	0·49	Northern	Central
Border Leicester	103,013	0·49	Northern	North-east
South Down	42,043	0·20	Northern	Central
Ryeland	14,158	0·06	Northern	Central
Lincoln	5,778	0·03	Western	Central
English Leicester	5,756	0·03	Gippsland	North Central
Suffolk	3,552	0·01	Western	Central
Shropshire	2,749	0·01	Western	Central
Zenith	1,916	0·01	Wimmera	North Central
Cheviot	1,261		Western	North Central
Hampshire Down	44		Central	Northern
Donald Down	19		Wimmera	Northern
Total other breeds	425,183	1·99	..	..

Details of Beef Carcass Appraisals — Melbourne Royal Show 1953.

Name and Address of Exhibitor.	Breed of Steer.	Date of Birth.	Live Weight. lb.	Dressed Weight. lb.	Appraisal Points. Eye Muscle Depth.	Fat Cover.	Leg Length.	Balance of Carcass.	Weight Suitability.	Rib Cover. Muscle.	Rib Cover. Fat.	Colour and Texture. Muscle.	Colour and Texture. Fat.	Marbling.	Total Points.
Maximum Points ..	..	..	..	..	20	15	20	10	5	5	10	5	5	5	100
Steer of Heifer Born on or After 1st September, 1952.															
Terrinallum Pastoral Co.	AA	4·9·52	778	478	20	11	14	10	4	4	8	4	4	2	81
J. Bott, Yarrawonga	AA	7·9·52	732	442	20	8	19	10	1	3	8	4	4	1	78
H. and S. Docker, Wangaratta ..	AA	5·9·52	756	462	16	10*	14	10	3	4	7	4	4	1	73
Steer With Chilled Carcass Weight 620 lb. or Under Suitable for Export.															
H. and S. Docker, Wangaratta ..	AA	16·3·52	926	583	18	12	17	10	5	3	8	4	3	3	83
H. and S. Docker, Wangaratta ..	AA	—·2·52	1,002	598	16	12	16	10	5	2	8	3	4	3	79
J. Bott, Yarrawonga	AA	18·12·51	892	552	18	8*	20	10	3	3	7	3	4	2	78
L. J. and A. L. Graves, Mansfield	AA	—·10·51	978	592	18	4	18	10	5	3	7	3	3	4	75
J. A. Hanson, Macarthur	PH	14·5·52	992	592	12	12	13	10	5	4	7	3	5	1	72
H. R. Spencer, Harkaway ..	H	1·8·52	952	565	10	17	17	10	4	4	10	3	5	2	72
Wilson J. G. Beer and Sons, Nanneella ..	RP	13·9·51	964	588	14	13	7	10	5	4	7	4	3	3	70
J. R. Allen, Mortlake	H	16·7·52	904	500	8	13*	11	10	1	4	9	4	5	1	66
L. J. and A. L. Graves, Mansfield	AA	—·10·51	950	563	14	3	13	10	4	2	7	3	4	3	63
W. S. Craig, Drumclog	RP	13·9·51	988	583	10	7	8	10	5	3	7	3	3	4	60
G. G. Howell, Wollert	PH	14·4·52	800	444	8	14	7	10	1	3	7	3	4	2	59
O. Lloyd Jones, Tarcutta	S	8·2·52	970	604	4	3	17	10	5	2	5	3	2	4	55
G. G. Howell, Wollert	PHxJ	8·4·52	914	527	14	5	7	10	2	3	6	3	3	1	54
Mrs. D. R. McCaughey, Wagga	S	17·2·52	906	559	6	5	12	10	3	1	6	4	3	4	54
Steer With Chilled Carcass Weight 621 lb. and Over Suitable for Export.															
W. J. Lenehan, Narrandera	PH	—·4·52	1,098	683	10	1	19	10	2	2	5	4	3	1	57
Lithgow and Ross, Coldstream	S	25·1·51	1,274	835	10	..	20	10	..	..	2	2	3	3	50
W. J. Lenehan, Narrandera	PH	—·3·52	1,082	665	6	..	17	10	3	1	5	4	2	2	50
Atkinson Bros., Swan Hill	DS	3·11·51	1,134	699	6	9*	3	10	2	3	7	3	3	3	49
John Lynn, Orbost ..	Sx	..	1,526	993	2	..	14	4	..	..	4	4	2	3	33
Carcass of Steer from Pen of Three not over 3 Years Suitable for Beef Export Trade.															
John and Kaye Lynn, Orbost	AA	..	1,388	817	12	11*	14	9	..	3	7	3	3	4	66
D. L. Murray, Ballendalla	Hx	..	1,226	731	8	14*	12	7	..	4	8	3	3	1	60
R. N. Scott, Kongwak	H	..	1,306	769	6	10	7	10	..	2	5	3	2	3	48
John Lynn, Orbost ..	AA	..	1,320	828	6	10	8	5	..	2	7	4	4	2	48
Carcass of Steer from Pen of Three not over 2 Years Suitable for Beef Export Trade.															
D. L. Murray, Ballendalla	Hx	..	1,194	714	10	1	12	7	1	2	6	3	2	2	46
Carcass of Steer Entered in Breed Class Only.															
C. O. Lorimer, Ocean Grove	RP	27·10·51	1,004	581	14	9*	9	10	5	4	7	3	4	2	67

Key: AA = Aberdeen Angus. DS = Dairy Shorthorn. H = Hereford.
J = Jersey. PH = Polled Hereford. RP = Red Poll.
S = Shorthorn.

* Lost points for being on thin side.

BUNT OR STINKING SMUT OF WHEAT

Progress Report on Seed Dusting Trials with Hexachlorbenzene (H.C.B.)

By J. W. MEAGHER, B.Agr.Sc., Plant Pathologist, Biology Branch

THE disease known as Bunt or Stinking Smut of Wheat, rarely causes serious losses in Victorian wheat crops today, as it is a standard practice for farmers to treat their seed before sowing, thereby keeping infection to a minimum. If the seed is not treated or, if the treatment is not thoroughly carried out, the fungus can soon build up to a stage where the disease becomes serious.

Whatever bunt-control material is used for seed treatment, it is emphasized that the effectiveness of the treatment largely depends on the treatment being carried out thoroughly so that each grain receives an adequate coating with the dusting material.

Two normal wheat ears (left) and four bunted ears (right). Smut balls are shown below.

Until 25 or 30 years ago, the method adopted for bunt control was to immerse the seed for a short time in either copper sulphate or formalin solutions. As well as being a clumsy process, this method usually interfered with the germination of the seed. A great advance was made in bunt control when these "wet pickling" methods were replaced by the "dry pickling" process, in which dusts of either copper carbonate or copper oxychloride were used. The dusts were much easier to apply and, compared with the wet pickles, the germination of the seed was not greatly affected. A further development in more recent years has been the use of organic mercurial dusts.

A few years ago, a new bunticide known as *hexachlorbenzene* (H.C.B.), was discovered in France as the result of a systematic testing of a number of organic compounds for their fungicidal properties. In work published in France, [1] H.C.B. was claimed to be a very efficient bunticide, and to have no effect on germination. It was also claimed that this material is non-toxic to man and domestic animals, and although experience with H.C.B. in Australia is limited, no evidence to the contrary has yet been reported. *Hexachlorbenzene* (H.C.B.) should not be confused with the insecticide *benzene hexachloride* (B.H.C.), which is used in the control of grasshoppers and other insect pests.

The promising results obtained in France, using H.C.B. in the control of bunt, led to similar trials being conducted by the Victorian Department of Agriculture at Longerenong Agricultural College over four successive seasons, 1949–50 to 1952–53.

In the first three years of trial, various percentages of three commercial preparations of H.C.B. were tested against copper carbonate and the most commonly used mercurial dust (which has the formula *ethyl mercuric chloride* and will be referred to here as E.M.C.).

In 1950 and 1951 another compound known as U.T. 11001, an organic combination of arsenic and sulphur, was included. The results of these trials are presented together in Table 1.

Methods Used

The wheat seed (variety Javelin) was inoculated with bunt spores at the rate of 1 : 500 by weight, and the various dusts were applied at the rate of 2 oz./bus. The seed was sown at the rate of 65 lb./acre with superphosphate, in plots five hoes wide and one-eightieth of an acre in area. Each treatment was replicated four times.

At maturity, the outer rows of the plots were discarded and the bunted heads in each plot were counted. The total number of heads in a plot was estimated by sampling.

The mean percentage of bunt infection in each treatment was then calculated.

TABLE 1.—RESULTS OF SEED TREATMENT TRIALS FOR BUNT CONTROL CONDUCTED AT LONGERENONG COLLEGE DURING THREE SEASONS, SHOWING THE EFFECTS OF VARIOUS SEED TREATMENTS ON BUNT INFECTION.

*Treatment.	Percentage Bunt Infected Heads.		
	1949.	1950.	1951.
Control (infected, not treated)	87·30	58·20	69·50
Copper Carbonate	9·38	3·29	1·04
U.T. 11001	..	0·19	0·14
Mercurial (Standard) E.M.C.	0·69	0·02	0·04
10 per cent. H.C.B. (Brand A)	0·21	0·03	0·02
11·2 per cent. H.C.B. (Brand B)	0·10	0·00	..
15 per cent. H.C.B. (Brand A)	0·06	0·00	0·01
15 per cent. H.C.B. (Brand B)	..	0·02	0·02
15 per cent. H.C.B. (Brand C)	..	..	0·03
20 per cent. H.C.B. (Brand A)	..	0·00	..
20 per cent. H.C.B. (Brand B)	..	0·00	..

* 2 oz. per bushel.

Statistical analysis of the results of each year's tests has indicated that :—

(i) All treatments were superior to the untreated seed.

(ii) In 1949–50, the H.C.B. dusts were significantly better than the mercurial dusts but in the next two seasons there was no difference between these treatments.

(iii) There was no difference in efficiency of bunt control between the commercial brands of H.C.B. that were tested.

(iv) In the two years in which it was tested, U.T. 11001 proved to be inferior to H.C.B. and the mercurial dust.

(v) Copper carbonate was inferior to all treatments.

The percentage of bunt in the sample treated with copper carbonate in the 1949–50 trial is high in comparison with that in later years. This is due, in part, to the fact that in 1949 a comparatively coarse-grained preparation was used. In later trials, the copper carbonate was finely ground and, before use, was passed through a 200-mesh sieve.

The 1952–53 trial was planned mainly with a view to obtaining further information on the minimum concentration of H.C.B. necessary for good bunt control, and to compare the effectiveness of a relatively high concentration of H.C.B. applied at a lower dosage rate. This latter aspect was included because it has been claimed that a dosage of 2 oz./bus. is too much to be held on the surface of the seed, and that a dosage rate of 1 oz./bus. gives a more efficient cover. Only one commercial brand of H.C.B. was used in this trial as all gave equal control of bunt in the previous trials.

The standard treatments of copper carbonate and the organic mercurial E.M.C. were again included, and two new organic mercurials were tested for the first time. The first of these, which has the formula of *ethyl mercury phosphate* (referred to here as E.M.P.), is applied as a dust in the usual way. However, the second, which has *methyl mercury dicyandiamide* as the active ingredient (referred to here as M.M.D.D.), is a liquid and is sprinkled on to the seed before mixing. This liquid was applied at the rate of 56 ccs. per bushel, which is equivalent to 2 oz. per bushel.

The methods of treatment and sowing were similar to those used in previous trials. At maturity all infected heads were counted except in the control plots where, because of the very high infection, an estimate of the percentage infection was obtained by sampling. The control was not included in the statistical analysis as the difference in infection between the control and the other treatments was obviously significant.

TABLE 2.—RESULTS OF SEED TREATMENT TRIALS FOR BUNT CONTROL CONDUCTED AT LONGERENONG COLLEGE IN 1952–53, SHOWING THE EFFECTS OF DIFFERENT SEED TREATMENTS AND DOSAGE RATES ON BUNT INFECTION.

Treatment.	Dosage oz. per Bushel.	Mean Percentage Bunt.	Transformed Mean.
Control (infected, not treated)	..	82·40	..
15 per cent. H.C.B. ..	2	0·35	1·497
10 per cent. H.C.B. ..	2	0·39	1·538
5 per cent. H.C.B. ..	2	7·59	2·847
25 per cent. H.C.B. ..	1	0·31	1·446
15 per cent. H.C.B. ..	1	0·88	1·910
10 per cent. H.C.B. ..	1	5·77	2·724
Copper carbonate ..	2	7·18	2·819
*Standard mercurial E.M.C.	2	0·37	1·533
*0·8 per cent. M.M.D.D. ..	2 fl.	1·17	2·020
*E.M.P.	2	0·09	0·898
Difference required for significance (Transformed means)—			
5 per cent. level			0·141
1 per cent. level			0·191

* E.M.C. = *Ethyl mercuric chloride*,
M.M.D.D. = *Methyl mercury dicyandiamide*,
E.M.P. = *Ethyl mercuric phosphate*.

From these results the decreasing order of efficiency of these treatments in the control of bunt can be expressed as follows:—

1. E.M.P. 2 oz./bus.
2. 15 per cent. H.C.B. 2 oz./bus., 10 per cent. H.C.B. 2 oz./bus., 25 per cent. H.C.B. 1 oz./bus. Standard mercurial E.M.C. 2 oz./bus.
3. 15 per cent. H.C.B. 1 oz./bus., 0·8 per cent. M.M.D.D. 2 fl. oz./bus.
4. 5 per cent. H.C.B. 2 oz./bus., 10 per cent. H.C.B. 1 oz./bus., copper carbonate 2 oz./bus.

Conclusions

(*a*) CONTROL OF BUNT—

(i) H.C.B. at a concentration of at least 10 per cent. and applied at 2 oz. per bushel controlled bunt as effectively as the standard mercurial dust applied at the same rate.

(ii) All treatments, except the low concentrations of H.C.B., gave better control than copper carbonate.

(iii) E.M.P. (*ethyl mercuric chloride*), in one year's test, was superior to all other treatments.

(iv) M.M.D.D. (*methyl mercury dicyandiamide*), in one year's test, was inferior to the normal concentrations of H.C.B. and to the other mercurial treatments.

(*b*) CONCENTRATIONS OF H.C.B.—

For best control of bunt, the concentration of H.C.B., applied at the rate of 2 oz./bus., should not be less than 10 per cent. If applied at the rate of 1 oz./bus., the concentration of H.C.B. should not be less than 20 per cent.

(*c*) DOSAGE RATES OF H.C.B.—

The 1952–53 results indicate that there is no gain or loss in efficiency of bunt control by applying a double concentration of H.C.B. at half the normal dosage rate of 2 oz./bus.

Summing up, the results to date of trials over four years have shown that, in the control of bunt, H.C.B. is more effective than copper carbonate and at least as effective as the standard mercurial dust. The compounds U.T. 11001 and the liquid mercurial M.M.D.D. have not controlled the disease as effectively as the treatments with H.C.B. or the standard mercurial dust. On the other hand, E.M.P., in the one year in which it has been tested, has shown itself to be a most promising bunticide. The trials are being continued to obtain further information in regard to these materials.

REFERENCE

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C. R. Acad. Agric. Fr. (Jan. 1945).

PASTURE COCKCHAFER CONTROLLED AT LOW COST

By S. ERLICH, B.Agr.Sc., Assistant Entomologist, Biology Branch

Over the past two years, as part of the research programme of the Biology Branch of the Department of Agriculture, a range of newer organic insecticides has been tested with a view to finding a cheap and effective method for cockchafer control. These experiments have demonstrated that the application in the autumn or winter of lindane at the rate of 4 oz. per acre would effectively control the cockchafer pest at a cost for material of about 7s. 6d. per acre. Lindane, which is the gamma isomer of benzene hexachloride, can be applied with superphosphate or as a dust.

Earlier work on this problem in Victoria showed that the control of this pest could be achieved by the application of 2 lb. of DDT per acre at a cost of about 25s., but because of the high cost per acre, this material, while used, was not widely adopted by growers.

It is believed that the marked reduction which has now been effected in the cost of treatment will make practicable the widespread and effective control of cockchafers which, in the past, have caused very serious losses to improved pastures in Victoria.

GRAZIERS have for years been greatly concerned at the damage from time to time to their improved pastures by the cockchafer grub. This native insect, *Aphodius howitti* Hope, which is the principal pest of pastures in Victoria, attacks pastures in the Western, Central, North Central, Southern Wimmera, North-eastern and Gippsland districts.

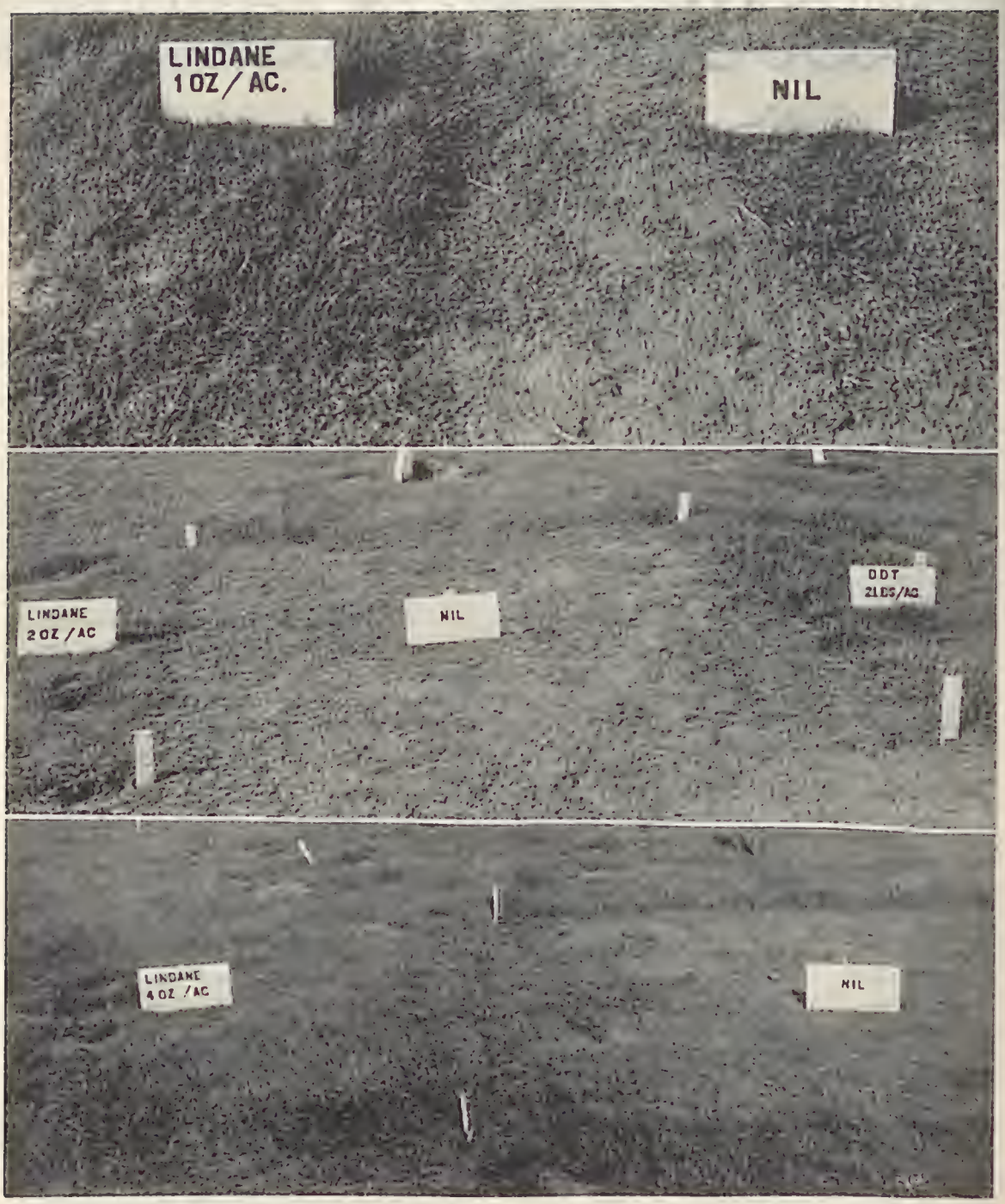
The damage to pastures as a result of cockchafer grub activity on the roots and tops not only reduces pasture production, but may so completely ruin the pasture that not a vestige of feed remains. In such cases, the population of cockchafers in the soil would be of the order of 75 or more grubs per square foot. This damage occurs during the autumn and winter at a time when pasture growth is slow and badly needed, and frequently necessitates additional hand feeding or a reduction in the number of stock carried on a property.

Subterranean clover and rye grass pastures are most susceptible to attack and this is aggravated by over-stocking.

Seasonal Activity of the Cockchafer

The eggs of the cockchafer, which hatch in 18 days, are usually laid in batches of about 24 in late January and early February by the adult beetles which are dark-brown to black in colour, $\frac{3}{8}$ inch long and $\frac{1}{8}$ inch wide and which swarm on warm humid nights. These beetles are attracted by lights and animal dung and as many as 4,000 beetles have been counted in one dung heap.

The young grubs hatch at the end of February to early March and feed on the roots of pasture, and come to the surface after the first autumn rains when the typical mounds of earth are thrown up. The grubs then feed on the surface growth and also carry some back to the burrows. At the end of August to early September these curled grubs,



Cockchafer control plots, Rutherglen Research Station, 1953. The top picture illustrates results of 1 oz. lindane per acre compared with "no treatment". The centre and lower pictures show the relative effects of 2 oz. and 4 oz. of lindane and 2 lb. of DDT per acre.

The top picture shows fully-grown cockchafer larvae (enlarged 2½ times); lower—eggs of the cockchafer (x6).

which are up to ¾ inch long and have brown head capsules, cease feeding and go into an inactive stage. They then change in colour from grey to yellow and turn into a pupal stage in December and emerge as beetles in January and February.

Control of the Cockchafer Grub

Earlier work on this problem in Victoria showed that the control of this pest could be achieved by the application of 2 lb. of DDT per acre at a cost of about 25s. per acre, but because of this high cost, this material, although used, was not widely adopted by growers.

Over the past two seasons a range of the newer insecticides was tested with a view to finding an effective and cheaper method for the control of this pest.

Laboratory tests at the Plant Research Laboratory, Burnley, and field tests at Skipton and Faraday (via Harcourt) were conducted during 1952. The following insecticides at varying strengths were tested :— DDT, lindane (gamma isomer of benzene hexachloride), BHC (13 per cent gamma isomer of benzene hexachloride), chlordane, aldrin and dieldrin. Of these insecticides *4 oz. of lindane* per acre was shown to be effective and was the cheapest insecticide to use for cockchafer control. Furthermore,

Typical cockchafer tunnelling at Rutherglen.

lindane 4 oz. per acre was shown in the Faraday experiments to protect pastures from damage for at least a second season.

In May, 1953, a series of insecticidal experiments for the control of cockchafers was established on the Rutherglen Research Station. Lindane, DDT, aldrin and dieldrin were tested at reduced strengths and against very young larvae. Lindane, at the rate of

Cockchafer beetles enlarged 2½ times life size.

Pupae of the cockchafer (5½). Left, Dorsal view; right, Ventral view.

2 oz. per acre and 4 oz. per acre, gave outstanding results at a cost of 3s. 9d. and 7s. 6d. respectively.

In June, 1953, another series of field plots was established with a view to testing the efficacy of lindane and DDT against maturer grubs. Lindane at 4 oz. per acre and DDT at 2 lb. per acre gave rapid and complete control of the pest. Lindane at 2 oz. per acre and 1 oz. per acre gave a highly significant reduction in the number of grubs but

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Left :—Pasture samples from cockchafer control plots at Rutherglen 1953. Left to right :—No treatment ; lindane 4 oz. per acre ; lindane 2 oz. per acre ; DDT 2 lb. per acre.

★

★

Right :—Samples of pasture from cockchafer control plots at Faraday, 1953, showing residual effect of 4 oz. lindane per acre applied in 1952. From left to right :— lindane 4 oz. per acre ; no treatment.

★

not as great as 4 oz. of lindane or the 2 lb. of DDT. There was a small reduction in pasture growth where 2 oz. or 1 oz. of lindane was used as against 4 oz. of lindane and 2 lb. of DDT. The pastures on untreated plots were almost completely destroyed by cockchafers.

In July, 1953, another series of field plots for the purpose of demonstration was established at Rutherglen. In these, lindane at 4 oz. per acre proved to be as effective as 2 lb. DDT per acre while lindane at 2 oz. per acre was almost as effective as the above two treatments.

Conclusion

1. *The results of this work over two years have shown that the cockchafer pest of pastures can be controlled by the application of 4 oz. of lindane per acre applied in the autumn or the winter and that this treatment prevents cockchafer damage in the following season.*

2. The results of one year's work at Rutherglen during 1953 have shown that lindane applied at the rate of 2 oz. per acre in the autumn has given as complete control of cockchafers as 4 oz. of lindane per acre. Where the 2 oz. of lindane was applied in the winter, a highly significant control was obtained, but not quite as good as the 4 oz. lindane treatment applied in the winter.

3. While DDT at the rate of 2 lb. per acre is effective for cockchafer control, its cost is about 25s. per acre as against about 7s. 6d. for 4 oz. of lindane and 3s. 9d. for 2 oz. of lindane. Investigations aimed at reducing the cost of treatment still further are being carried out.

4. The lindane may be applied to pasture mixed with superphosphate or as a dust.

A technical paper covering the above work will be published in a subsequent issue of this Journal.

Pork and Bacon-Pig Competition

MELBOURNE ROYAL SHOW, 1953

By L. A. DOWNEY, H.D.A., Pig Expert, and A. D. NORTH, B.Agr.Sc.,
Live Stock Research Officer

THE annual competitions for pork and bacon pigs conducted by the Royal Agricultural Society of Victoria again created intense interest among pig raisers and others. The number of entries was not as great as would be expected in view of the advertising value and prize list offered for these classes in the Royal Show schedule.

The live pig of Messrs. I. E. and F. Hawtin's 1st prize-winning Berkshire entry in the bacon pig class. Its litter mate's carcass scored 88½ marks.

Fifty-one pig breeders exhibited in the stud pig classes at the Show, but only seventeen of them made entries in the pork and bacon-pig classes, and some of their entries did not arrive at the Show for various reasons.

There were several breeds represented in the pork and bacon-pig entries either as pure-breds or as first crosses. The Berkshire had the strongest representation. Seven of the eleven bacon pigs judged were Berkshires. Pig breeders who recognize the advertising value of this competition should realise that if their pigs are not in it they cannot win it.

The litter and entry mate of Dookie Agricultural College's 1st prize porker carcass which scored 86 marks. It was a Large White x Berkshire.

The Berkshires won, not only because they dominated the class numerically; they were of very high quality as is shown in Table 2.

The conditions of the pork and bacon-pig competitions require that each entry shall comprise two pigs from one litter. Their sires and dams must be pure-bred, though they may be of two different breeds. When shown, the two pigs of each pair of

porkers must not differ in live weight by more than 15 lb. The two pigs of each baconer entry must not differ by more than 25 lb. in live weight. As a further means of ensuring that exhibitors will show evenly-matched pigs in each pair, the one pig to be slaughtered is selected by drawing.

The side of the 1st prize bacon carcass, Messrs I. E. and F. Hawtin's Berkshire. Its dressed carcass weighed 143 lb. It scored 7 marks for ham (possible 8), 5½ for shoulder (7), 9 for streak (12), 26 for loin muscle (28), 19 for back fat (20), 18 for body length (20) and 4 for leg length (5), making a total of 88½ from the possible 100 marks.

The side of the 1st prize porker carcass, the Large White x Berkshire entered by Dookie College. Its carcass weighed 96 lb. and scored 7 marks for ham (possible 8), 5½ for shoulder (7), 10½ for streak (12), 24 for loin muscle (28), 18 for back fat (20), 20 for body length (20), 1 for leg length (5), making a total of 86 out of the possible 100 marks.

The judging is done only on the carcass of one pig of each pair. The other pig is allowed to remain alive in the pen during the Show, to demonstrate the correlation between carcass composition and live-pig conformation.

The carcasses were judged by Mr. John M. Wilson, using the Smithfield system.

A feature of this year's bacon class was the win for the third time by the Colac breeders Messrs. I. E. and F. Hawtin, making them now the outright winners of the R. A. Buller Trophy.

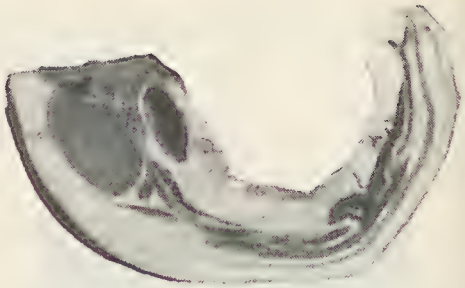
The winning bacon pig entry was only half a mark ahead of the entry of Messrs. L. B. Dean and Son, whose entry was equal first with Mr. B. Whelpton's in last year's competition.

The Dookie Agricultural College won the pork-pig class for the second year in succession.

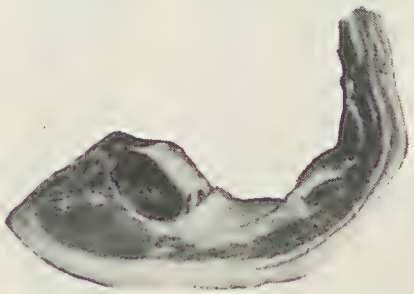
Although the Smithfield method of pig carcass appraisal has been used and demonstrated constantly in Australia for the last sixteen years, some pig breeders still do not fully understand some aspects of it.

The greater part of the appraisal is done by measurement of several parts of the carcass. Each measurement when taken is converted to an award mark. That award mark is based on the relationship of that measurement to the weight of the carcass. For example—to gain full marks (20) for body length, a carcass that weighs 140 lb. should measure 805 millimetres (approximately 32 inches) from the aitch bone to the first rib, but a 170 lb. carcass measuring 805 millimetres gains only 8 marks for body length. It should measure 865 millimetres (over 34 inches) to gain the maximum 20 marks. Measurements of body length, leg length, muscle thickness and fat thickness are all marked according to the weight of the carcass.

It sometimes happens that a carcass has an unusually thick layer of flare fat. That gives its middle extra weight without a corresponding increase in length, and so that carcass loses marks for its length in relation to weight. That principle is based on sound economics too. The flare fat when made into lard is sold by the bacon curer for about 1s. 6d. per lb., whereas for middle bacon, the curer receives 4s. 6d. per lb. Therefore, excessive flare fat in a carcass means a substantial difference in the net cash return to the bacon curer.



The loin cut of the 1st prize bacon carcass.



Loin cut of the winning porker carcass.

The people who buy pork and bacon show a marked preference for abundant lean and just enough fat. That is also the kind of meat that scores best in the Smithfield method of carcass appraisal. Hams, and middles are preferred to shoulders; also bone (as indicated by long or thick legs) is not wanted by consumers. Those preferences are also taken care of in this method of appraisal.

The accompanying photographs and tables give some further impressions of the results of these competitions.

TABLE 1.—SUMMARY OF POINTS SCORED IN COMPETITIONS HELD IN THE LAST SEVEN YEARS.

Highest Scores.

Year.	Porker.	Baconer.
1947	78	86½
1948	79½	86
1949	86	86
1950	78½	90
1951	84	83½
1952	81½	83½
1953	86	88½

TABLE 1.—SUMMARY OF POINTS SCORED IN COMPETITIONS HELD IN THE LAST SEVEN YEARS—*continued.*

Average Scores.

	Possible Points.	Average for Porkers.							Average for Baconers.						
		1947.	1948.	1949.	1950.	1951.	1952.	1953.	1947.	1948.	1949.	1950.	1951.	1952.	1953.
By Inspection—															
Hams—well filled and fine in bone	8	4·2	4·1	5·7	5·8	5·4	4·8	5·9	4·9	6·5	6·7	6·2	6·1	6·3	6·7
Shoulders—light	7	3·9	5·4	5·0	5·45	5·4	4·4	4·7	3·5	5·5	5·3	5·8	5·2	5·3	5·4
Streak—thick, full of lean meat	12	7·9	6·1	10·4	9·65	8·1	7·5	7·7	9·5	6·3	8·85	10·6	6·4	8·7	9·0
By Measurement—															
Loin muscle—thick	28	18·5	15·7	17·9	14·3	19·5	20·0	19·8	20·6	22·6	22·3	24·8	19·8	22·4	23·3
Back fat thickness—correct proportion	20	15·9	15·0	13·7	13·6	14·5	15·9	16·2	12·9	15·0	16·5	17·0	13·3	16·2	14·3
Body length—in proportion to weight	20	16·3	17·9	17·1	17·7	16·2	15·8	18·9	9·5	11·7	11·85	12·0	15·1	14·2	15·6
Leg length—short	5	1·3	1·2	1·7	1·5	1·4	2·0	1·1	3·0	3·0	2·9	3·7	2·5	2·5	3·1
Total	100	68·0	65·4	71·6	68·0	70·5	70·4	74·3	63·9	70·6	74·4	80·2	68·4	75·6	77·4
No. appraised		18	15	15	10	13	11	15	27	21	13	11	10	19	11
Average carcass weight lb.		90	81	79	86	74	74	84	168	166	167	161	145	154	155

TABLE 2.

Breeder's Name.	Breeding.		Age in Days.	Live Weight.	Dressed Weight.	Total.	Place.
	PORK PIGS.			lb.	lb.		
Dookie Agricultural College	S. Dookie Chico D. Dookie Beauty	Large White x Berkshire	114	130	96	86	1
Hawtin, I. E. and F.	S. Dearborn Astra D. Rossmoyne Sunray 112th	Berkshire	121	109	80	79½	2
Twaits, D. G.	S. Wandeen Penkethman 5th D. Emerald Vale Jill	Large White	121	125	92	79	3
Bruce, J. E.	S. Rossmoyne Lad 23rd D. Edgerton Melba 119th	Large White	102	102	74	78½	4
Bruce, J. E.	S. Rossmoyne Lad 23rd D. Wandeen Penance 5th	Large White	84	122	95	78	5
Whelpton, B.	S. Strathfield Climax D. Woodsleigh Mist Queen	Berkshire	119	116	84	77½	6
Roy, W. A.	S. Plainley Cassanova D. Morrels Gloria 11th	Berkshire	120	107	73	75	7
Hawtin, I. E. and F.	S. Dearborn Astra D. Rossmoyne Sunray 112th	Berkshire	121	99	69	73½	= 8
Whelpton, B.	S. Strathfield Climax D. Woodsleigh Mist Queen	Berkshire	119	123	93	73½	= 8
Taylor, B. H.	S. Rossmoyne Knight 102nd D. Wandeen Penelope	Large White	120	95	70	72	10
Salvation Army Farm and Training Centre	S. Clarendon Statesmen 4th D. Ascalon Vanity	Large White	134	93	67	71	11
Hawtin, F. W. and O. M.	S. Glen-Due Felix D. Glen-Due Delia	Tamworth	84	114	82	62	12
Andrew, A.	S. Winslade Commando D. Rossvill Mally	Wessex Saddleback	152	123	95	61½	13
Osborne, L. R.	S. Eastside Uplifter 53rd D. Green Isle East Lass 10th	Large White	121	110	81	60	14
Dookie Agricultural College	S. Woodsleigh Beauty's Boy D. Dookie Merry 5th	Berkshire	140	137	106	86½	Overwght.
	Averages		118	114	84	74·3	

TABLE 2—*continued.*

Breeder's Name.	Breeding.		Age in Days.	Live Weight.	Dressed Weight.	Total.	Place.
	BACON PIGS.			lb.	lb.		
Hawtin, I. E. and F.	S. Dearborn Astra	Berkshire	183	186	143	88½	1
	D. Rossmoyne Sunray 111th ..						
Dean, L. B. and Son ..	S. Adlooka Very	Berkshire	223	219	167	88	2
	D. Adlooka Glory						
Castle, L. H. ..	S. Clarendon Wonder 13th ..	Large White	159	179	137	86	3
	D. Clarendon Princess						
Hawtin, I. E. and F.	S. Dearborn Astra	Berkshire	183	190	138	85½	4
	D. Rossmoyne Sunray 111th ..						
Dean, L. B. and Son ..	S. Adlooka Raider	Berkshire	213	214	163	85	5
	D. Adlooka Clearmark						
Dookie Agricultural College	S. Woodsleigh Beauty's Boy ..	Berkshire	184	217	160	76	= 6
	D. Strathfield Miranda						
Whelpton, B. ..	S. Hawkesbury Campaigner 66th	Berkshire	253	250	194	76	= 6
	D. Hemswell Bonny 2nd ..						
Whelpton, B. ..	S. Hawkesbury Campaigner 66th	Berkshire	253	232	175	72	8
	D. Hemswell Bonny 2nd ..						
Castle, L. H. ..	S. Clarendon Wonder 13th ..	Large White	159	191	149	67½	9
	D. Clarendon Princess						
Osborne, L. R. ..	S. Eastside Uplifter 53rd ..	Large White	177	175	137	66½	10
	D. Clarendon Sunbeam 2nd ..						
Gardiner, J. M. ..	S. Clarendon Premier 7th ..	Large White	226	191	140	60	11
	D. Wavelea Molly						
	Averages		201	204	155	77·4	..

Is a simple arrangement that multiplies the power at the handle 260 times—handy to use, easy to move, quickly rigged, and works in roughest country. Standard equipment pulls trees and stumps from 1½ acres without changing anchor. Many other time- and labour-saving features. Catalogue with pleasure.

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THE DAIRY FARM

These dairy cows on a Tongala farm are protected by a well-planned shelter belt.

Shelter Trees on Farms

TREE-CONSCIOUS farmers who have not yet provided their farms with enough shelter trees, will be interested in the programme carried out by Mr. R. Kerger on his 300-acre farm at Freshwater Creek in the Geelong district. During the past five years 3,000 trees have been planted on this farm and are doing very well.

The driveway to the new brick homestead is planted with Golden Cypress which are now about three years old, healthy and impressive.

Mr. Kerger also has a portion of a shelter break planted with tall Sugar Gums, but does not advise the use of this tree as its tall growth habit leaves the trunk bare for some feet above ground. Trees which do well and make an excellent windbreak are Dwarf Sugar Gum, Tuart Gum, and—now being planted for windbreaks in new subdivisions—Western Australian Cornuta Gum. All of these are light flowering trees with a bushy growth from the ground, and are recommended as most suitable for the area.

Mr. Kerger also has grown Lambertiana Cypress, but prefers not to use this variety unless trees grown from cuttings of good parent stock can be obtained. He has found that trees grown as grafts are apt to die out—sometimes in whole sections—after a few abnormal seasons.

Forestry Commission officers explain that the Macrocarpa Cypress usually grows with the horizontal branching habit, but some variants have branches at a steeper angle. One of these was propagated by cuttings as the well-known Lambertiana type. This can be grown either as a cutting on its own roots or, more cheaply, as a graft on ordinary Macrocarpa stock. If its seed is planted the ordinary Macrocarpa type is likely to result.

The Macrocarpa rootstock is less tolerant to extremely wet or extremely dry seasons than is the Lambertiana. Although both types were lost last year where drainage was inadequate, many of the trees which died were grafts.

When buying Lambertiana trees, farmers are advised to accept only those accompanied by a written guarantee that they have been raised as cuttings grown on their own roots. They will cost more than grafts, but the extra expense is justified.

This methodical farmer uses his "good idea book" for jotting down a helpful hint.

Farm beautification and the establishment of shelter belts are long term projects, and some thought might be given to them before the next tree-planting season.

[L. A. GRILLS, Dairy Supervisor.]

Notes for the "Good Idea Book"

Many dairy farmers use ropes for operating bail tongues and exit doors. These save a lot of walking and are to be recommended, but they can become very dirty with use and, being hard to clean, are always a source of contamination in the shed.

Mr. Alexander Lacey of Tyntynder Central has solved this problem by threading the rope through white plastic tubing of approximately ¾-inch diameter. The tubes are in lengths of about two feet and are placed on the ropes where they are handled. They are wiped over each day and never remain soiled.

Some farmers keep a "good idea book". This idea could well be added to such a book, or it could be used as the first item in a new book of this kind.

[J. C. NEWMAN, Dairy Supervisor.]

Better Meetings are Possible

"Those-in-favour-against-carried", says the chairman in one breath. A few hands waver up to shoulder height then down again, but most of those present have not even bothered to vote.

How often have we been to meetings like that, where the chairman and Joe and George have already had things so well worked out that even those on the outer fringes of the committee seemed powerless to add anything worthwhile to the discussion?

There is discussion, of course, but it all occurs in little groups after the meeting. Then real doubts are raised and, in many cases, time proves that these doubts were well founded. In meetings conducted in this manner fewer and still fewer people will attend.

How often have we thought of a really good question at a field day, only to have forgotten it before the lecturer has finished his seemingly endless talk about things which did not quite fit our problem?

How often, at a large conference, have we felt the need to discuss a point with the few around us, only to find that we are denied this right and are forced to vote with unclear minds?

Remedies for these ills, which beset dairy farmers' as well as other meetings, are suggested in a lively book, *New Ways to Better Meetings*, by Bert and Frances Strauss. "What's Wrong with our Meetings?", "Can the Chairman Stop being Boss?", and "Salvaging Problem Members" are three of the chapter headings, while another, "Discuss and Decide", is a three-word summary of the new method suggested. This consists of discussion led by a leadership team instead of a chairman, leading to agreement without recourse to voting on one of two alternatives. The method is so devised that discussion will stick closely to the issue of immediate interest and will not wander into bypaths. An interesting feature is the period spent at the end, in which the meeting evaluates its own performance, and uses that experience to improve later gatherings.

To chairmen and secretaries, and to all others who sincerely wish to make their clubs and branches really alive and productive,

a serious study of this book is well worth while. And would it not be fitting that dairy farmers, who discuss their problems so well in informal groups, should give the lead in the reform of meetings?

[K. M. Sillcock.]

Dairy Farmer Relieving Service

There is no time of the year at which the work on a dairy farm comes to a standstill. There are slack times when an owner or worker can easily get away from a dairy farm which normally employs the services of two or more people, but the farmer who does all his farm work without other help sometimes finds it hard to get a capable substitute to allow him to go on holidays with an easy mind, and he is in an even worse position if illness overtakes him.

Recently two men with long experience in dairy farming announced their intention to set up as relieving dairy farmers. This innovation should be of interest to those farmers who rely entirely on their own efforts. Although new to Victoria, the idea has been tried for some years in Britain, where it has proved highly successful.

Another approach to the problem has been made by a group of farmers in one district of New Zealand. This group jointly employs a farm worker, who is assured of year-round employment on the various farms within the group. His services are available where they are needed in an emergency and where the farmer wishes to take a holiday, or otherwise as rostered. It is a definite condition that dirty or unpleasant jobs are not to be saved up specially for this worker to do.

[K. M. Sillcock.]

Safety Hint for Silage Makers

In consolidating silage stacks of the wedge or ramp types, farmers are torn between the desire to roll them as closely as possible to the edges and the need to avoid any risk of the tractor slipping off the stack.

In an article on silage making, the *New Zealand Dairy Exporter* states that some farmers in the Dominion have overcome this problem to some extent by rolling their stacks in a herringbone pattern. That is, the tractor is driven obliquely between the mid-line of the stack and one edge, so that only the front wheels go near the edge. After the tractor has worked its way down the stack in a series of oblique moves back and forth, it is taken up again and driven down the other side in a similar series of runs between the centre and the edge.

Comments from farmers who have tried this method would be greatly appreciated.

[K. M. Sillcock.]

The Young Farmer

How many aspects of farm management are quite complex and yet are so taken for granted that nobody has bothered to write about them in a way which might help a beginner?

Who, for instance, has written at length on farm drainage, a problem which exercised so many minds last year? There is one New Zealand book on the subject, but I have not heard of any Victorian work dealing with all its aspects, including mole draining. The tasks of experts are commonly supposed to overlap, but there are, it seems, "No Man's Land" areas of knowledge which their spheres of activity do not even touch.

Another such question recently came as a request for a design for a farm workshop.

Toolshed on the farm of Mr. H. J. Hamley, Dingee, northern Victoria.

If you have never tried to answer such a request, just make the attempt, and see how impossible it is to get a clear-cut answer. The truth is that every farm may demand a different kind of workshop, and the size and equipment will vary according to the uses to be made of the farm repair service. The following are only some of the things which will influence the design and the choice of equipment to be obtained.

Degree of mechanization.
Types and complexity of farm machines.
Size of the farm.
Skill of the farmer, or other workers, in repair work.
The farmer's leaning towards, say, carpentry, or towards machine servicing.
His inventiveness.
His skill as a blacksmith.
A flair for neatness and the orderly storage of tools and spare parts.
Distance of the farm from other repair facilities, such as a local garage with welding equipment.
Financial considerations.
Climate.

Take three farmers of your acquaintance and try to visualize what kind of workshop each would be likely to establish for himself.

It is also interesting to ask what basic equipment every farm workshop needs. First, a good solid bench—perhaps two benches, one for carpentry and one for metal work. Above or close to these should be stored the appropriate tools, well-protected, easy of access.

Orderly storage is also needed for spare parts, and more especially for bolts, nuts, screws and nails of various sizes. It is not very satisfactory to have them all together as a rusted mass in a 7-lb. jam tin.

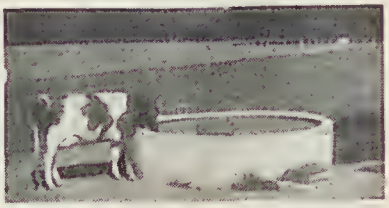
A strong vyce is a *must*, and perhaps a pipe vyce too, if the farm water supply is still due for some extension. A forge may be a necessity, and an anvil is useful even for "cold blacksmithing" by those of the baling-wire school. A grinding wheel will save you from blunted tools. Boring equipment for wood and metal is needed, and so are such items as saws and hacksaws, punches, chisels, cold chisels, tin-snips, and files. A soldering outfit also has many uses about the farm. Where there is machinery, spanners will have been accumulated, but it is still useful to have some special spanners and wrenches for all kinds of work.

A sink or large dish let into the bench is most useful. Many a machine part is much easier to handle after the clinging grease and dirt have been washed off with kerosene.

These are but a few of the many useful things to be found in farm workshops. Usually the equipment is not bought according to any plan, but just grows as new needs arise, and in the end the supply of tools and spare parts overflows the storage space in the workshop. How much better if the room were to be planned in the first place, with some idea in mind of the amount of storage and working space which might be needed later. This is the time to think of your workshop, before you have your own farm. It may be a long time before you own all the costly items of equipment, but you can at least ensure that, when you do, you will have facilities to use them to best advantage.

There is still, to my knowledge, no complete guide written on this subject. But the farmer is fortunately endowed with plenty of commonsense and the ability to work out his own problems. With a few suggestions to give him a starting point, he can usually work out his workshop problem quite well—if it should occur to him that it is worthy of some thought. But how many fail to give it any thought at all.

[K. M. Sillcock.]



Tomato Diseases and their Control

Contributed by
Officers of the Biology Branch.

Part I of this series of articles on tomato diseases and their control appeared in the March issue of the Journal.

Septoria Leaf Spot

LEAF Spot of tomatoes caused by the fungus *Septoria lycopersici* has at times caused severe damage to tomato crops in this State. It is recognized by the presence on the leaves of small dark circular spots which have grey centres and dark coloured margins. Not infrequently the spots unite and the leaf shrivels and dies. The disease works upwards affecting the entire foliage with the exception of that at the tips of the stems, leaving fruit and stems bare. Such fruit is usually affected with sunscald.

Tomato leaves affected with Target Spot or Early Blight
[After *Samuel*

In the centre of a leafspot small black specks will be seen. These are the fruiting bodies of the fungus from which a yellowish, mucilaginous mass containing the spores of the fungus is produced during periods of wet weather. These spores are splashed by rain on to healthy plants and so the disease is spread. This fungus overwinters in the debris from diseased tomato plants, from which spores are produced in the following spring.

It has been found that the fungus does not survive on infected refuse which is ploughed in deeply at the end of the season.

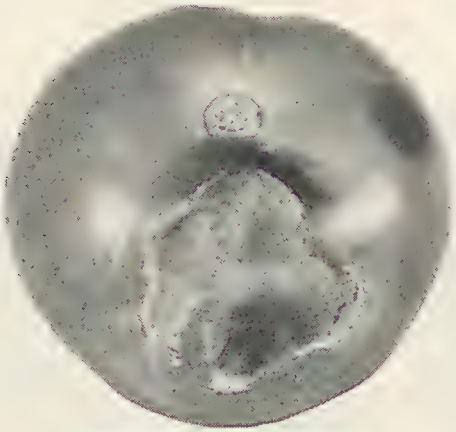
For control of leaf spot it is important that diseased plants be removed and burnt. Seedlings should be raised in sterilized soil and should be protected by two applications of a suitable copper dust (containing 7 per cent. copper) while in the seed bed. When the plants are established in the field, periodic dusting with a similar copper dust should be carried out. In the application of the dust special care should be taken to cover both the lower and upper leaf surfaces.

Weeds such as thornapple and nightshade, which are also hosts of the fungus should be vigorously suppressed.

Target Spot (Early Blight)

Target Spot, or Early Blight, may cause serious damage to tomato plants in all stages of growth. It is characterized by the presence on the leaves of dark-brown or black circular or irregular spots which often show concentric rings or ridges, hence the name Target Spot. These spots are at first small, but under favorable conditions, they increase rapidly and run together. The lower leaves are the first to be affected. These turn yellow, wilt and die. The disease may affect not only the leaves, but also the leaf stalk, stem and fruit. The infected fruit develops sunken areas on which a black mould appears and the fruit decays. Seedlings grown under warm, humid conditions may be seriously affected by a stem-girdling or collar-rot phase of the disease.

The fungus causing this disease, *Macrosporium solani*, is spread by means of spores carried in air currents, produced on the diseased spots and it overwinters on the debris of diseased plants. Plants which are not in full vigour from various causes are more liable to infection. Moist conditions with fairly high temperatures favour the development of the disease.



Tomato attacked by Early Blight

As the presence of target spot indicates lack of vigour in the plants attacked, attention should be given to cultivation and manuring.

Seedling plants should be protected by two applications of a suitable copper dust (containing 7 per cent. copper) while in the seed bed. When the plants are established in the field, periodic dustings with a similar copper dust should be applied.

Nailhead Spot

Nailhead Spot, caused by the fungus *Alternaria tomato*, may attack tomato plants at any stage of their growth. The symptons of this disease on the leaves and stem are similar to those of Early Blight which is caused by a closely related species of fungus. On the fruit, however, the small lesions (the so-called Nailhead Spotting of the fruit) are very different from those caused by Early Blight.

On the fruit, the first signs of Nailhead Spot are minute brown lesions which enlarge until approximately $\frac{1}{4}''$ in diameter. If the spots are numerous, they tend to run together. The lesions are slightly sunken at the centre and become greyish-brown with the passing of time. Fruit which is ripening may remain green around these spots.

The recommendations for the control of Early Blight are also applicable to the control of Nailhead Spot.

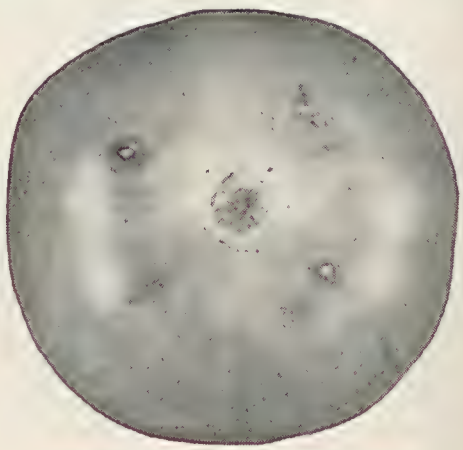
Late Blight

In certain seasons where heavy rains fall in January, February and March associated with cloudy, muggy weather, late blight fungus *Phytophthora infestans* may develop on tomatoes. Both the fruit and leaves may be attacked, but the fruit generally is more commonly attacked than the leaves. On the fruit, slightly sunken, irregular areas may be seen, whereas on the leaves dark-brown or black blotches appear, generally on the tips and sides. On the under surface of diseased leaves a greyish-white mould will be seen if the weather is warm and moist. Dark streaks will show on the stems and leaf stalks until the whole plant is black and dead.

Immediately the disease appears, plants should be dusted with a suitable copper dust. Where copper dusts are applied regularly in a routine manner for the control of early blight and leaf spot, the onset of late blight will be prevented.

Potatoes also are susceptible to this disease so that where possible, tomatoes should not be grown in the vicinity of potatoes nor should they follow potatoes in crop rotation.

Late Blight sometimes affects seedlings grown in trays in commercial glasshouses. An outbreak of this type may cause heavy losses unless the disease is recognized and counter measures are taken at an early stage. Watering should be reduced to a minimum and the glasshouse opened up for maximum ventilation. Dusting of the plants with a copper dust is also necessary.



Nailhead Spot on fruit of the tomato

Leaf Mould

Tomato Leaf Mould caused by the fungus *Cladosporium fulvum* was first recorded as occurring in Victoria in the spring of 1934. It is mainly confined to tomatoes growing under humid greenhouse conditions, but has been observed in field tomatoes growing adjacent to a glasshouse of affected plants.

Effects of Late Blight attack shown on these tomato leaves by the dark areas.

Small white downy patches appear on the under sides of the leaves of infected tomato plants, and these patches are accompanied by a yellowing of the tissue on the corresponding parts of the upper leaf surfaces. The colour of the fungal growth changes, as the disease progresses, from a pale-buff colour to tawny olive and is surrounded by the advancing white margin. Such leaves are soon killed and as they dry out the downy patches become purple and the upper leaf surface changes from yellow to reddish-brown when the leaf is dead. The fungus may also occur on the stems.

Infection of both the calyx and the ovary of the flowers has been noted and the calyx usually dies from the top towards the base. In slight attacks the old leaves only are affected and little injury results. However, in severe cases the reduction of the leaf area so weakens the plant that fruit production ceases and the plant dies prematurely. The spores of leaf mould are air borne, and overseas workers have shown that infection readily occurs under conditions of dull light, humid atmosphere and temperatures between 68°F. and 77°F. The fungus overwinters by means of these spores which remain viable in a dry condition for approximately twelve months.

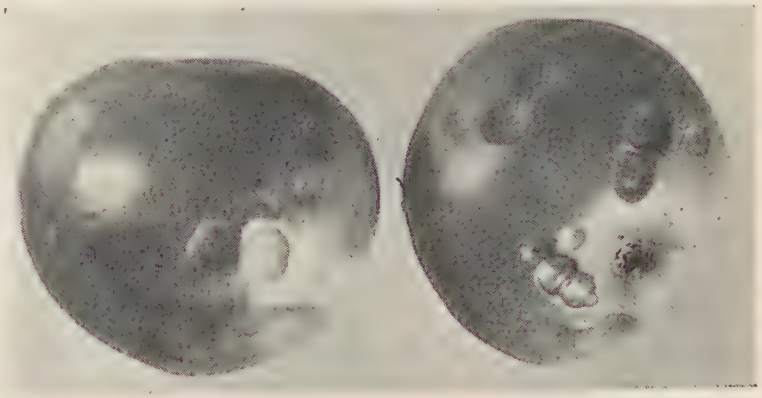
CONTROL.—For the control of leaf mould, the following measures may be taken :—

1. Where houses contained infected plants during the previous season, they should be fumigated, prior to planting, with sulphur dioxide, burning sulphur at the rate of 1 lb. of sulphur to 1,000 cubic feet space.
2. The provision of a dry atmosphere for the growing of plants by means of adequate ventilation, efficient air circulation and care of watering is a most important condition to secure, without which spraying measures are of little avail.
3. Successful results have been obtained in the control of the disease from spraying with Shirlan A.G. at a dilution of 3 lb. to 100 gallons.

Control is reported to be most successful where the treatment is commenced when the plants are small and continued at intervals of two weeks. Shirlan A.G. can be combined with any of the copper sprays and with lead arsenate, D.D.T. and nicotine sulphate.

Anthracnose

Anthracnose of tomatoes, caused by the soil inhabiting fungus, *Colletotrichum phomoides*, can result in appreciable loss of ripening fruit. Although the fungus is capable of attacking the foliage, roots and



Tomato fruits showing depressed, circular spots caused by Anthracnose.

(continued on page 524.)

"CERTIFIED" and "APPROVED" VEGETABLE SEEDS

Growers for 1952-53 Season—French Beans, Garden Peas, Onions, Tomatoes

By R. O. KEFFORD, B.Agr.Sc., Horticultural Research Officer

Good quality seed is the basis of successful vegetable production. To assist vegetable growers to obtain good quality seed, the Department of Agriculture operates four vegetable seed schemes, namely—French Bean (certified), Garden Pea (approved), Onion (certified) and Tomato (approved). Certified seed (blue label) and approved seed (red label) are sealed by Departmental officers following strict supervision and inspections throughout the planting, growing, and harvesting of these crops.

Any grower desiring to make application to submit a crop of French bean, garden pea, onion and tomato seed for certification or approval next season, should write as soon as possible to the Superintendent of Horticulture, Department of Agriculture, Treasury Gardens, Melbourne, C.2., for information on the details of each scheme.

The Department of Agriculture does not deal in seed, but will assist intending buyers of "certified" seed by passing on applications for seed to growers who are able to supply it. All supplies of "approved" garden pea seed have been allocated, but supplies of "certified" Brown Globe and Australian Brown onion seed, "certified" Brown Beauty and Hawkesbury Wonder French Bean Seed, and "approved" tomato seed of all main varieties are still available.

THE often heard remark that "the seed is running out" indicates that the vegetable grower is well aware that good seed is the basis on which his whole programme rests. The most profitable vegetable crop is one with a high percentage of first quality plants, and seed of good quality is of primary importance in producing such a crop. Good quality vegetable seed is a good strain of the variety best suited to local conditions, true to type, free from seed-borne diseases, of a high percentage germination and free from weed-seeds and other foreign matter. Seed merchants and vegetable growers also demand a seed sample of good appearance.

Trueness to Type

The maintenance of a true-to-type strain of vegetable seed requires particular care on the part of the seed-grower. In self-pollinated crops such as tomato, bean and pea, impurities in the seed-stock may originate mechanically or through changes in the seed itself, e.g., rogues, buck plants, and plants of earlier and later maturity. The production of a true-to-type line of seed involves rigorous rogueing of all off-type plants and plants of other varieties, the selection of outstanding plants for mother seed production, and the isolation of the seed crop from other crops in the same family by a sufficient distance to prevent chance cross-fertilization between crops. This procedure is followed in the French bean seed certification scheme and the garden pea and tomato seed approval schemes, the regulations for which lay down maximum percentages of off-type plants allowed, minimum distances between crops of different varieties and state that only mother seed approved by the Department of Agriculture may be sown to produce "certified" or "approved" seed crops.

A true-to-type strain of seed of cross-pollinated vegetable crops (e.g., onions) is maintained by the selection by skilled operators of bulbs to a rigid standard for shape, skin cover, flesh colour and quality, and by isolating the seed crop from other seed crops of the same family by a distance of at least ¼ of a mile.

Mechanical impurities in a seed-stock may be caused by dirty seed drills and sacks, careless harvesting, dirty threshing and seed cleaning machinery. Supervision by Departmental officers during these operations ensures that mechanical impurities in "certified" and "approved" seed are kept to a minimum.

Purity and Germination

All seed sold for sowing must comply with the standards of purity and germination set out in the Victorian Government *Seeds Act* 1935 (see Table 1).

TABLE 1.—PURITY AND GERMINATION STANDARDS SEEDS ACT 1935.

Crop.	Maximum Percentage of Other Crop Seeds Allowed.	Maximum Percentage of Weed Seeds Plus Inert Matter Allowed.	Maximum Percentage of Weed Seeds Allowed.	Maximum Percentage of Non-germinable Seeds Allowed.
Beans	0·1	1·25	0·25	25
Onions	0·1	0·75	0·25	50
Peas	0·2	1·25	0·25	25
Tomatoes ..	0·1	2·25	0·25	30

The production of seed which will meet the requirements of the Seeds Act requires specialized knowledge on the part of the seed grower of the correct time to harvest the crop, of methods of handling the crop so that it cures without sweating, in the adjustment of harvesting, threshing and cleaning machinery so that all inert matter is removed and bruising and splitting of seed is avoided, and in bagging and storing the seed.

Seed-borne Diseases

There are many serious seed-borne diseases of vegetable crops, the most serious being those which cannot be controlled by dusting, dipping or hot-water treatment of seed. The only method of producing crops free from those seed-borne diseases which cannot be controlled by seed treatment, is to sow seed produced from disease-free seed crops. A French bean seed crop is not eligible for certification unless it is free from the bacterial blight diseases—halo blight and American blight and the fungous disease anthracnose, and contains less than 5 per cent. of plants showing bean mosaic virus disease at any of several inspections made by Departmental officers during the growing season. A garden pea seed crop is not eligible for approval if it contains any trace of bacterial blight on any part of the plant, or lesions of ascochyta blight or septoria blight on the pods, and a tomato crop is not eligible for approval if there is more than a trace of visible symptoms of seed-borne diseases during field inspections.

GROWERS OF "CERTIFIED" FRENCH BEAN SEED—SEASON 1952–53.

Grower.	Address.
Brown Beauty.	
Buckland Brothers	Mallacoota
Burgermeister, W.	Boisdale
Cameron, A. and Alesendri, E.	Marlo
Green and Barton	Mallacoota
Higgins Brothers	Glenmaggie
Johnston, J. H.	Gipsy Point
Joiner, T.	Tostaree
Langley, T. L.	Goongerah
McIntyre, D.	Club Terrace
McKenna Brothers	Glenaladale
Somerville, T. J. H.	Murrungowar
Spaull, V. E.	Hawkhurst, via Dargo
Stevens, A.	Wongrabelle
Walker, W. H.	Gipsy Point
Hawkesbury Wonder.	
Joiner, T.	Tostaree

GROWERS OF "CERTIFIED" ONION SEED—SEASON 1952–53.

Grower.	Address.
Australian Brown.	
Burns, Allan	Corunnun
Carmody, E. P.	Coragulac
Carmody, J. J.	Warrion
Craig, C. R.	Warrion
Finley, E.	Coragulac
Henderson, J.	Portarlington
Hutchinson Brothers ..	Drysdale
Kahl, M.	Murgheboluc
Lindsey, P. H.	Woodford
O'Brien, K.	Warrion
Pearce, E. V.	Ondit
Roache, J.	Nalangil
Sheehan, W. H.	Port Fairy
Brown Globe.	
Burns, Allan	Corunnun
Carmody, E. P.	Coragulac
Carmody, J. J.	Warrion
Delorinzo, C.	Warrion
Finley, E.	Coragulac
Lindsey, P. H.	Woodford
O'Brien, K.	Warrion
Richens, D.	Waarncoort
Sheehan, W. H.	Port Fairy

Growers of "Approved" Tomato Seed—Season 1952–53.

Grower.	Address.
Break O'Day.	
*Woodward, C. F.	Gapsted
Burwood Prize.	
*Lyons, A. C.	Whorouly East
*Nicholl, E. and Son ..	Whorouly East
Grosse Lisse.	
*Farrington. F. W.	Bright
†Kneebone, R. S.	Gapsted
*Lyons, A. C.	Whorouly East
*Nicoll, E. and Son	Whorouly East
*Woodward, C. F.	Gapsted
Marglobe.	
*Farrington, F. W.	Bright
Potentate.	
†Kneebone, R. S.	Gapsted
*Nicoll, E. and Son	Whorouly East
Red Cloud.	
*Farrington, F. W.	Bright
*Lyons, A. C.	Whorouly East
*Nicoll, E. and Son	Whorouly East
*Woodward, C. F.	Gapsted
Rouge de Marmande.	
*Lyons, A. C.	Whorouly East
*Woodward, C. F.	Gapsted
South Australian Dwarf Red.	
†Kneebone, R. S.	Gapsted
Scoresby Dwarf Canner.	
*Woodward, C. F.	Gapsted

Growers of "Approved" Tomato Seed—Season 1952–53—*continued.*

Grower.	Address.
Tatinter.	
*Lyons, A. C.	Whorouly East
Tatura Dwarf Globe.	
†Kneebone, R. S.	Gapsted
*Nicoll, E. and Son	Whorouly East

Crops marked * were grown under contract to Arthur Yates and Co., 44 Burwood-road, Hawthorn, and those marked † were grown under contract to Messrs. H. Fredman and Co., Shepparton. Orders for "approved" tomato seed should be addressed to these firms to whom all seed has already been delivered from growers' properties.

Growers of "Approved" Garden Pea Seed—Season 1952–53.

Grower.	Address.
Greenfeast.	
Anderson. W. C.	Drysdale
Lane Brothers	Killarney
Sheehan, W. H.	Port Fairy
Tapp, N.	Camperdown

Note.—The following officers were in charge of the inspectional duties in the growing crops:—*French Bean Seed*—Mr. L. A. Jager, Field Officer, Department of Agriculture, Melbourne. *Garden Pea and Onion Seed*—Mr. J. R. D. Jones, Vegetable Supervisor, Department of Agriculture, Colac. *Tomato Seed*—Mr. B. P. Krone, Tomato Culturist, Department of Agriculture, Melbourne; Mr. C. R. M. Webb, Tomato Supervisor, Department of Agriculture, Shepparton.

TOMATO DISEASES—PART 2—(*continued from page 521*)

fruit of tomato plants, it is usually only the fruit which suffers measurable damage. The parasite enters the fruit through an injury or wound to the surface of the skin, but infection of foliage and roots appears to occur without the aid of wounds.

On the fruit, the first symptoms of anthracnose are small depressed circular spots which gradually develop concentric rings and also become darker, as they enlarge. Finally, numerous dark specks (the fruiting bodies) form in the centres of these spots and great masses of pink spores are exuded from the fruiting bodies during warm, humid weather. The pink spots so formed are the characteristic symptom of the disease.

Control.—Since the fungus appears to overwinter in the soil mainly on infected tomato debris, tomatoes should not be planted in infested land for at least four years after a diseased crop has been removed, Poorly drained soils should be avoided, if possible, as the disease occurs most frequently on such ground. Losses from this disease will probably be reduced where a copper fungicide is normally applied for the control of leaf diseases.

A further instalment of this series of articles, Tomato Diseases and their Control, will appear in a subsequent issue of the Journal.

Garden Notes for December

By GEORGE HYAM, Horticultural Supervisor

THE FLOWER GARDEN

Hedges make an effective windbreak for houses in exposed situations.

Shelter for the Home Garden

DAMAGE done to garden plants by wind probably exceeds that caused by insect pests and a good deal of this damage is not always readily apparent, nor results in the total destruction of the plants.

Vibration by wind interferes with root development; the scorching of the foliage by hot winds or by salt-laden gales in coastal districts is frequent in gardens and the effect of these is often attributed to other causes.

The need for shelter from strong prevailing winds is recognized by all who have gardens in exposed situations, but what is often overlooked is the damage that can be caused by only moderate winds or even strong draughts eddying around buildings or even through and around badly placed shelter plantations.

The provision of sufficient shelter from wind is a personal problem for each garden in relation to its aspect, and one which is not always easy to solve in advance. There are, however, some points that should be borne in mind when considering the planting or erection of a break. While protection from strong air currents is always desirable, many make the mistake in planting close breaks around gardens to such an extent that there is not air circulation within the protected area. This encourages disease and damage by frost. In many cases, the shade cast by tall trees robs the garden plants of the sunlight they should have, to say nothing of the competition of the roots of such trees with garden plants. The eventual height and species of trees or shrubs planted, therefore, should bear some relation to the size of the plot they are to protect.

In this regard, the following formula can be of use in designing a breakwind either of trees or shrubs or some artificial protection like a paling fence or a tea-tree screen. A close break will provide a zone of still air for five times its height. Thus, a 6-ft. paling fence shelters an area of 30 feet. Such a break will also provide partial shelter for a distance of about fifteen times its height at ground level, which in actual practice is sufficient for garden crops other than shrubs or trees and even for these for about half this distance and to the extent of the height of the break.

Another point is that it is not necessary or usually desirable to block all air movement but rather to break the force of winds. Consequently it is usually better to provide breakwinds which will allow some air circulation through their branches or even between the individual plants used for the breakwind. At the same time, it is not desirable to use trees which do not bear branches for some considerable distance up their trunks unless they are interplanted with some low-growing bushy shrub. Such gaps concentrate heavy winds and the major effect of the break is lost where low-growing crops are to be grown behind them. In paddocks, this can also cause wind erosion.

Probably the ideal shelter for gardens is a screen of brushwood consisting of straight stems of tea-tree with their lateral twigs left on them, inserted between wires, bush-house fashion. This allows air circulation through the break without any force and there are no roots to compete with the nearby plants.

Apart from the labour involved in clipping a close hedge, there is little air circulation through it, and any of the usual species grown extend their roots for a considerable distance, occupying too much space in small gardens.

For ornamental gardens, two or three "staggered" rows of ornamental shrubs, perhaps including a few trees, will provide a pleasing breakwind which can be embodied in the general layout. It is not necessary for these to actually interlace each other; the force of the wind will be broken even if there are some gaps between. In planning such a shelter-belt, species known to resist wind damage or, in the case of coastal districts where salt-laden winds can be expected, species having resistance to salt damage should be selected for the windward side. Then, and for second and third rows, more tender subjects can be planted.

Narrow pathways or drives between buildings in built-up areas form tunnels where eddying winds blowing around these buildings from almost any direction can cause damage. These should have lattice gates or permanent trellises erected across them to break the force of such draughts.

Breakwinds for the Larger Areas

Many farm homesteads are situated on high and exposed situations without any natural protection from the contours of the country around them. In such cases, high breakwinds are a virtual necessity for the benefit of the garden and for comfort in the homestead itself. These are not necessarily planted in the garden itself. Trees are needed here but as these take some years to grow to effective height, some quick growing species should be planted around the garden as a temporary break. One of the most effective species for this purpose is the Boobialla which has been planted successfully in all parts of the State. It flourishes even in relatively dry districts though provision of moisture in summer will speed up its growth to the extent that it will reach a height of 8 feet in about three years. This species, like most others, will not tolerate too wet conditions caused by bad drainage. Boobialla is also very useful for interplanting between permanent trees or conifers to nurse these until they are large enough to resist severe winds.

Temporary Breakwinds in Gardens

Pending the growth or erection of permanent breakwinds, shelter to growing garden crops can be provided by sowing rows of rye corn spaced about 50 to 60 feet apart. Even when this is mature, the straw is stiff enough to provide a break and is not easily flattened by wind. Rye corn will grow in any part of the State.

In vegetable gardens, much can be done by utilizing the taller growing crops to provide shelter on the windward side for lower growing crops in season at the same time; for instance, staked tomatoes will provide shelter for rows of beans, lettuce or cucurbits. Sweet corn is worth growing for its sheltering effect as well as for its cobs. In unprotected, new flower gardens, wind shake can be avoided by supporting annuals with twiggy brushwood inserted alongside them when planting. All newly-planted shrubs will benefit by being supported by light stakes for the first year or two.

Some wind-resistant shrub species suitable for breaks and those which are the most tolerant to salt spray for coastal areas will be reviewed in next month's notes.

Better Crops from Perennial Climbing Beans

Climbing beans either of the annual varieties such as Epicure (French type), Mont d'or (Waxpod), or the perennial Scarlet Runner or White Monarch are being increasingly favored by home gardeners on account of the small amount of space they need and the ease with which their pods can be picked. There is, however, one drawback, namely their great tendency to fail to set their summer-produced flowers.

There are two causes for this; too much exposure to hot winds and too little moisture at the roots. This trouble is not unknown even in the milder climate of England. The first cause can be eliminated or at least mitigated by providing protection from westerly winds and from the north by running the rows north and south. The writer has seen consistent crops set during hot weather for some years past produced by a commercial grower who has planted scarlet runners on the eastern side of a tea-tree brush break-wind, which gives them protection from the westerly sun and wind and also knows of several instances of successful cropping in private gardens where the rows are either protected by, or climbing upon, a western fence. A daily light sprinkle with hose of the foliage and flowers every morning and evening during hot weather will also help in any situation.

As perennial climbing beans need rather warmer conditions than dwarf beans, there is little point in sowing before early November and the flowers from these will meet such hot conditions. As the first flowering is relatively small, December planting can be better in the first instance as then the main flowering and podding will be when the weather is milder and more humid.

In most districts, there is little difficulty in getting a satisfactory autumn crop. The shoots from second year and older crowns of perennial beans grow rapidly in spring and so, after the first year, there is every chance of getting a good early setting even where the plants have little or no protection as suggested above for mid-summer cropping.

Climbing beans ascend and cling by their natural spiral growth and not by tendrils which spread their stems in various directions

A climbing-bean trellis made from saplings. When the beans cover the trellis they act as a useful windbreak for other vegetables.

as peas do. This points to the fact that the best support for them is in the form of a single rod or pole or string for each plant. The term for climbing beans in America is "Pole Beans" indicating this natural habit. Under this system, the stems form a thick column of stems and foliage and it would seem that this affords some protection to the setting flowers as they usually crop rather better than if allowed to straggle over a wire netting or trellis support. When podding occurs, these are easier to see and to pick. The plants and supports should be spaced at least 10 inches to 12 inches apart for perennial beans. The pinching back of runner beans is sometimes advocated, but the best and largest pods will be found on beans that have been allowed to climb to their full height which is about 8 feet. Few pods will set on stems that are waving about above their support.

When the time comes to cut off the previous season's stems in early winter, do not cut these too close to the crown, but about 6 inches above that level. Next year's buds are formed just at the junction of the old stems and the crown and the stub of the old stem will protect these. If necessary, the

roots can be lifted during their winter dormancy and transplanted to a new area, but transplanting is not essential. Although perennial, it is best to make new sowings after the third crop though they will persist much longer with gradual reduction in yield after that time.

Climbing beans in common with dwarf beans are subject to attack by red spider which causes the typical yellowing and variegation of the foliage and a withering or other malformation of pods. Red spider can also prevent a normal setting. In the home garden, the simplest control is by routine sprays of lime-sulphur or one of the colloidal sulphur preparations, applied every three weeks. Nicotine sulphate sprays can be used to eradicate any red spider that is present but the effects do not persist. It is essential that the backs of the leaves should be covered with the spray as these insects do not operate on the upper surface. This can be achieved by keeping the nozzle close to the foliage and thus allowing the pressure to turn the leaves over.

Home-grown Gherkins

Gherkins and pickled cucumbers can be readily grown and processed by home gardeners and two or three plants will supply ample for the average household needs. There is little difference between the varieties of cucumber grown for this purpose and those grown for salads, the distinction being mainly a more prolific production of smaller fruits, thinner skins and a less seedy centre. For home use, the fruits of pickling cucumbers can be used for both purposes by allowing those to be used for salads to grow on to a larger size but not until they turn pale in colour.

The method of cultivation is the same for both, i.e., planting three or four seeds to a hill with a spacing of 3 feet each way between hills, on beds which have had plenty of compost or rotted manure worked into the soil. An ounce of a complete fertilizer should be spread in a ring round each hill in the form of a drill 2 inches deep and about 4 inches away from the seeds. November–December sowings will produce good crops. The difference between gherkins and pickled cucumbers is purely a matter of size. Gherkins are small fruits picked before they exceed 3 inches in length and while they still have the remnants of the flowers on the end opposite the stem. For pickling cucumbers, the fruits are left to develop to a stage further but not beyond about 5 inches in length and about 1½ to 2 inches in diameter if they are to be pickled whole. The best available pickling varieties are Heinz Pickling; Boston Pickling or Chicago Pickling.

The main point in securing good yields is to pick the fruits while still immature. Allowing them to develop to maturity or to the size of salad cucumbers, slows up the formation of others. Thus it is necessary to pick over the plants very frequently, starting when the first fruit appears. In the flush of the season, this has to be done daily.

For pickling, the fruits should be immediately placed in a non-metallic vessel containing a brine made with 1 lb. of salt to a gallon of water. If the harvested fruits are kept exposed to the air for some hours, they will become withered and lose their crispness. The fruits in brine will keep in good order for weeks, enabling pickling to be deferred until the end of the season. The method of pickling can be found in The Fruit and Vegetable Preserving Bulletin, obtainable from the Department of Agriculture, Melbourne, C.2. The price, 2s. 6d. includes postage.

The JOURNAL of the Department of Agriculture

VICTORIA AUSTRALIA

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Editor: V. C. G. Lewis.

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Photograph on Front Cover—A heavy yield of pasture hay harvested in the Beaufort District.

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By A. MORGAN, B.Agr.Sc., Senior Irrigation Officer

THE numbers of growers of green fodders in the various districts of Victoria give a good indication of the possibilities of summer fodder crops in those districts. The most recent figures are shown in Table 1.

TABLE 1.—NUMBER OF GROWERS OF GREEN FODDERS, 1948–49.

District.	Crops Grown for Green Feed.		
	Maize.	Millet.	Other Crops (Excluding Lucerne).
Central	1,130	479	181
Gippsland ..	1,049	550	120
Western	209	142	87
North-Eastern ..	85	229	86
North-Central ..	56	33	84
Northern ..	85	229	86
Mallee	5	50	33
Wimmera ..	8	10	9

In reading the above table, it should be kept in mind that, in some districts, for example, Wimmera and Mallee, the growers are probably on a stock and domestic water-supply channel of the State Rivers and Water Supply Commission, from which they obtain a limited amount of irrigation water on a sales basis, or they may have small water-rights because their properties adjoin main supply channels between storages and irrigation districts. In the Northern District, where the greater part of the State's irrigated area is located, ample irrigation water is available, without which summer fodder crops could not be grown, except in such exceptional situations as non-saline lake beds which have dried up in drought periods. This method was used in the bad droughts of the 1940's. Except where assisted by irrigation, therefore, the growing of summer forage crops is practically restricted to Central Gippsland, Western and North-eastern Districts, the boundaries of which are taken to be those shown in the Victorian Year Book. Sudan grass is the only summer forage crop suitable for districts where the average annual rainfall is below 23 inches. If it is attempted in those districts the seeding

rate requires to be adjusted to fit the available moisture, in the same way as seedings are reduced for dry-land lucerne-growing.

ACREAGE GROWN

The acreage of green-fodder crops grown in Victoria has fluctuated widely in the last 25 years, as shown by Table 2.

TABLE 2.—ACREAGE OF GREEN FODDER CROPS GROWN IN VICTORIA, 1928–52.

Year.	Total Acreage Grown (all Crops).	Maize Grown for Fodder.	Sorghums and other Annual Fodders Grown *under Irrigation.*
	ac.	ac.	ac.
1928–29 ..	107,351	†	41,130
1929–30 ..	169,253	†	59,401
1930–31 ..	126,437	22,660	29,787
1931–32 ..	119,006	25,655	30,479
1932–33 ..	107,732	25,870	28,410
1933–34 ..	121,737	29,053	23,557
1934–35 ..	115,037	24,904	25,605
1935–36 ..	111,056	26,971	20,776
1936–37 ..	102,744	26,543	19,753
1937–38 ..	121,839	25,271	26,548
1938–39 ..	108,796	26,114	26,942
1939–40 ..	91,441	20,547	14,528
1940–41 ..	130,738	25,848	32,159*
1941–42 ..	97,158	20,693	18,951
1942–43 ..	103,598	17,051	11,572
1943–44 ..	112,880	17,641	25,807*
1944–45 ..	73,159	17,307	34,326*
1945–46 ..	63,311	17,407	15,152
1946–47 ..	49,659	12,245	17,657
1947–48 ..	46,100	10,873	8,685
1948–49 ..	50,847	10,947	9,937
1949–50 ..	44,928	8,311	7,903
1950–51 ..	41,279	6,753	5,097
1951–52 ..	45,661	†	†

* Drought years. † Not available.

As shown in Table 2, there has been a considerable decline in the acreage of green-fodder crops grown since the 1940's. Two reasons are advanced—lack of labour during the war period, and increased emphasis on pasture improvement. A slight revival in interest in summer forages may result from increase in the number of spray irrigation plants in the non-irrigation districts, but the total acreage involved will necessarily be small.

In the irrigation districts, the acreage of Japanese millet and sorghums may rise sharply whenever a drought occurs in adjoining cereal-growing areas. (As it did in 1939–40, 1943–44, 1944–45.) By spring, the cereal growers are well informed as to the condition of their crops, and, if failures or low yield appear likely, they are able to make arrangements for the use of an irrigable area and to grow millet or sorghums for either sheep feed or as a seed crop which can be taken off with their wheat-harvesting machinery.

WHAT IS THE VALUE OF SUMMER FORAGE CROPS ?

The summer forages can be used to advantage on both dairying and sheep properties ; the bulk of fodder which can be produced is very high ; the nutritive value of the fodder is good. For their most economical usage, the bulkier crops (maize, ambercane, imphee, and saccaline) require to be cut, and this introduces a higher labour cost than in the case of pasturage. The expense of preparation of the seed-bed and sowing, is recurring. The question is one requiring a detailed examination of costs which vary a good deal with locality and, for that reason, it is not proposed to do any more than give a draft of the items which should be taken into account when estimating the probable cost of growing the crop. These are, per acre :—

(*a*) Ploughing (or rotary hoeing) ;

(*b*) Workings for tilth and weed control ;

(*c*) Seed—

maize, 28 lb. ;

Japanese millet, 10 to 20 lb. ;

Sudan grass, 10 to 15 lb. ;

ambercane, imphee, or saccaline, 5 lb. ;

A flourishing crop of sorghum under irrigation.

(*d*) Manure, ½ to 1 cwt. superphosphate ;

(*e*) Sowing ;

(*f*) Harrowing (?) if surface crusts formed after rain ;

(*g*) (i) Temporary fencing for grazing or electric fencing for grazing—

(millet and sudan grass)

(ii) Cutting, carting, and feeding out ; cutting, carting, chopping, and ensiling—

(maize and sorghums)

(iii) Cutting as hay, carting, stacking—

(millet and sudan grass).

RAINFALL, SOIL, AND SEED-BED

Intending growers, particularly those who have recently purchased properties in districts in which they have had little or no experience of local conditions, should be guided by men of reasonably extensive experience of district conditions. Most crops have been tried in each district at some time, and valuable knowledge of previous trials (and errors) can be gained by conversation with the right people. "*Wise men learn by the experience of others, fools learn by their own.*"

Allowing for the over-riding factor of local experience, however, some rules of thumb can be laid down as follows :

A crop of maize on river flats at Orbost at picking time.

Rainfall

In non-irrigation areas—

below 23 inches average annual rainfall, sow Sudan grass only ;

above 23 inches all may be sown.

Irrigation areas—

all may be sown irrespective of rainfall.

Soil

In non-irrigated areas and irrigated areas—

Maize—rich soil desirable ;

Japanese millet and Sudan grass—grow well on wide range of soils ;

Ambercane, imphee, and saccaline—grow well on medium to rich soils.

Seed-bed

A clean, firm, moist seed-bed is the best in all cases.

A heavy crop of saccaline.
[*Block, G. & N. Co-op.*]

Left.—Japanese millet is a favoured fodder for grazing in irrigation areas.

Lower.—Sudan grass makes a succession of growths through the summer period, producing fine-stemmed fodder suitable for grazing or conservation when mature.

Without irrigation sowing should be done in moist soil.

With irrigation the seed may be drilled into moist soils, whether the grey and brown soils of heavy texture, or the red-brown earths.

Dry sowing, and irrigating to initiate germination, may be done on the heavy grey and brown soils, but is not recommended for the red-brown earths. Japanese millet, on account of its small seed (see "Seed Quality" hereunder) is best surface-sown when dry sown. It may also be sown over "native" grasses after harrowing or cultivation and "irrigated up".

Seed Quality

The relative sizes of the seeds are indicated in Table 3.

TABLE 3.—NUMBER OF SEEDS PER LB.

Japanese millet	136,000
Sudan grass	100,000
Subterranean clover ..	65,000
Saccaline	27,000
Abercane, Imphee	23,500

The points to be looked for in assessing seed quality are:—

1. Low percentage of trash.

2. Seed bright and hard (test it by crushing with a pocket knife on a hard, flat surface).

3. No signs of mould. This is particularly important because the seed of these plants is very liable to over-heating if permanently bagged too soon after harvesting. (Seed production is confined to the northern districts of Victoria where hot, dry weather gives better ripening, but this is also conducive to more rapid heating of freshly-bagged seed.)

4. Good germination. This is more difficult for the farmer. Sellers usually can refer to a seeds laboratory test of the line, but no certification scheme is operating for these crops.

The *Seeds Act* prescribes not more than 25 per cent. non-germinable seeds for Japanese millet, not more than 30 per cent. for sorghums, and not more than 35 per cent. for Sudan grass.

5. Freedom from weeds. This is also a problem for the average farmer. It is easy to distinguish weeds which are of different species (e.g., thistles) but two of the more important weeds not so readily distinguishable are—

(*a*) Johnson grass;

(*b*) Sudan grass hybrids.

NOTE.—See "Description of Seeds," page 531.

SEEDING RATES AND VARIETIES

Maize

Varieties suitable for green fodder are Hickory King and Flat Red. For early crop, Longfellow or Ninety Day.

Rate of Seeding—28 lb. per acre, in rows 18 to 30 inches apart.

Japanese Millet

Sow at rate of 10 to 20 lb. per acre, according to the excellence of the seed-bed.

Sudan Grass

Average rainfall up to 23 inches—3 to 6 lb. per acre. Average rainfall 23 inches or more—10 to 15 lb. per acre. Irrigation areas—10 to 15 lb. per acre.

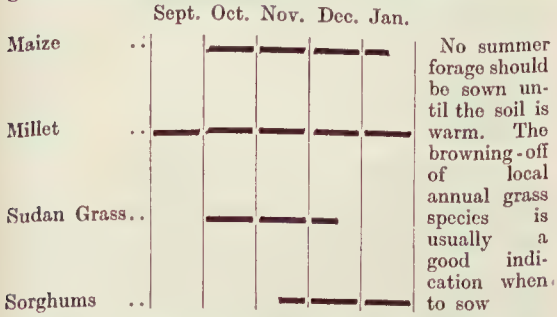
Japanese millet may be grazed without risk of poisoning, preferably before it reaches maturity. *[Photo S.A. Jnl. of Agr.]*

Ambercane, Saccaline, and Imphee

For the higher rainfall and irrigation country, sow 4 to 5 lb. per acre in drill rows from 2 to 3 feet apart.

TIME OF SOWING

The following chart illustrates how, in suitable localities, a succession of sowings, giving green feed in due course, can be made :—


Sept. Oct. Nov. Dec. Jan.
Maize
Millet
Sudan Grass
Sorghums
No summer forage should be sown until the soil is warm. The browning-off of local annual grass species is usually a good indication when to sow

For a succession of green fodder, the order of sowing is Japanese millet, Sudan grass, and sorghums. Saccaline is the best to last into the late autumn and early winter.

METHOD OF SOWING

Maize

The methods which have been used are :—

(1) *Ploughing in*, the seed being dropped by hand behind the plough in every fourth or fifth furrow at the second ploughing (shallow).

(2) *Maize planter*—most satisfactory.

(3) *Drilling*—the row spacing desired being arranged for by blocking some of the cups.

(4) *Broadcasting*—least satisfactory method.

Japanese Millet

Drilled in moist soil or broadcast on surface to be brought up by subsequent rains.

Sudan Grass and Sorghums

Drilled in moist soil. The row spacings for the sorghums arranged by blocking some of the hoes.

FERTILIZER

It is recommended that at least ½ cwt. of superphosphate per acre be used at seeding, particularly with millet and sorghums under irrigation, otherwise these crops tend to impoverish the ground and encourage an invasion of useless weeds.

EARLY TREATMENT OF THE CROP

Maize

If grown without irrigation, some inter-row cultivation may be necessary to conserve moisture by killing the weeds. The first harrowing can be given when the young plants are 6 inches high. Any workings must be progressively shallower.

Japanese Millet, Sudan Grass, and Sorghums

Where crusting and caking of the surface occurs, due to heavy rain (or irrigation) on some soils, a light harrowing in the early

stages may be required. In some cases, sheep are turned in to mulch the surface.

If grown under irrigation, a second watering may be necessary at a short interval (e.g., a week); after that the period may be extended to three weeks or more. Japanese millet requires the most frequent irrigation.

UTILIZATION

Maize

Maize can be grazed at any stage of growth, but as it does not make re-growth after grazing, and in its early stages is not a good milk producer, it is more valuable if fed out as the grain is hardening from the milk stage. This is also the proper stage to cut for ensilage.

Up to 7 or 8 feet in height it can be cut with a binder but imposes a heavy strain on the machine. The other alternative is hand-cutting.

Japanese Millet

Japanese millet is absolutely safe for grazing as early feed, at any time after reaching 6 inches in height, which stage is usually reached six weeks or so after germination. It recovers well from grazing and, as its fodder value decreases with maturity, it is inadvisable to let it go to head. The amount of fodder obtained decreases with each grazing.

The crop cannot be used for seed production in southern districts. If not required for grazing, in the North-east or in the Northern irrigation districts, it may be cut with a binder for dry hay, or mown and baled, or stripped for seed. Seed merchants advise that no great expansion in seed production is invited as, owing to the reduction in acreage sown in recent years, sufficient seed is being produced to meet requirements.

Sudan Grass

Sudan grass can also be fed off regularly during the summer months and, if not required for that purpose, can be cut for hay (sheaf or baled). Of the sorghums, it is the least likely to cause prussic acid poisoning. It is as well to avoid grazing it if growth has been checked by frost or dry conditions. A height of 18 inches to 2 feet is favoured for feeding off. As with millet, the use of temporary or electric fencing avoids wastage due to trampling and selective grazing.

Ambercane, Imphee, and Saccaline

Ambercane, Imphee, and Saccaline can be sown to provide a succession of feed in the order given. To avoid risk of poisoning, they should not be grazed after growth has been checked. To avoid *all* risk, they should not be grazed until flowering; however, this rule is not adhered to in practice, and poisoning is not common. Being very tall growing, they do not appear at first sight to be suitable for sheep grazing. However, the sheep soon learn to straddle the stems, pushing the upper leaves down to a height at which they can be grazed.

If not required for grazing they can be ensiled, but the labour involved is great. Seed harvesting involves benching, and cutting each head separately with a sharp knife, in the same manner as broom millet heads are taken off. The knife is held pointing downward, with the blade away from the operator, and the stalk is drawn over the knife edge. The heads are placed on the "bench" to dry out, and subsequently threshed.

SEED YIELDS

Average yields of seed per acre are:—

Japanese millet—approximately 18 cwt.

Sudan grass, approximately 7 cwt.;

Ambercane, &c., approximately 5 cwt.

The seed from late-sown crops of all the species is likely to be too moist, because of unsuitable harvesting weather.

DESCRIPTION OF SEEDS

The following descriptions of Sudan grass and Johnson grass seeds are adapted from those given by Coleman and Holdsworth, *Queensland Journal of Agriculture*, June, 1936.

Sudan grass—Seeds shiny, colours varying dark yellow, often tinged red, brown, or black. Attached stalklet shows jagged appearance at top. Jagged appearance at base of seed. Size varying from $4\frac{1}{2} \times 2\frac{1}{2}$ mm. to 7×2 mm., and $1\frac{1}{4}$ to 2 or more mm. thick. Kernels dull light-brown, plump.

Johnson grass—Seeds shiny, black, sometimes brown or dark-yellow. Attached stalklet cup-shaped at top. Base of seed rounded. Size 4×2 mm. and 1 mm. thick. Kernels dark-coloured.

It is not possible to be *absolutely* certain that a sample of Sudan grass does not contain some Johnson grass seeds.

Citrus Field Day at Mildura

Growers inspecting trees on the new rootstock trial at Irymple.

OPENING the annual Mildura citrus field day on Wednesday, October 21, the Superintendent of Horticulture, Mr. Frank M. Read, stressed the dual role that every grower can play in the task of advancing agricultural knowledge.

Firstly, the research programme depends for much of its direction on the problems observed and reported by growers. Observant growers can often provide, from their experience, important evidence that would take research workers much time and expense to find unaided.

Secondly, the extension programme cannot reach every grower personally and, if the findings of research are to be spread throughout the community, growers must pass on the knowledge they receive.

The field day was held in two sessions. In the morning at Mr. Petersen's property at Red Cliffs, pest control was discussed. In the afternoon, at Mr. M. Scamangas' block at Irymple, rootstocks and handling were treated. In the interim, lunch was provided by the Mildura District Citrus Growers' Co-operative Association.

THE ROOTSTOCK PICTURE TODAY

Mr. W. I. Nankivell, Horticultural Research Officer, presented the annual progress report on trends in the two rootstock trials.

The 1934 Trial

In the older trial, which was set out in 1934 to compare sweet orange, sour orange, and citronelle as rootstocks for Washington navel and Valencia late oranges, the trends of past years have continued.

Most trees on sour orange stock have now succumbed to the virus disease, "bud union decline". Trees on sweet orange stock, though requiring more care and time to establish, have proved to be superior for Navels and Valencias on both light and heavy soils.

YIELD IN BUSHELS/ACRE.
(1 bushel = 50 lb. of fruit.)

Year.	Washington Navel.		Valencia Late.	
	Sweet Orange.	Citronelle.	Sweet Orange.	Citronelle.
	bush./acre.			
1952–1953 ..	690	410	720	710
1953–1954 ..	1,060	610	..	..
Total Production since Planting	7,700	5,800	6,500	5,500

The trees on sweet orange have been consistently larger and healthier than those on citronelle. This superiority has been

Messrs. D. M. McAlpin (left) and C. R. Johnston (centre), discussing citrus problems with grower, Mr. R. Hollins.

particularly noticeable on the heavier soils of the trial. Boron poisoning is evident on these soils and has injured the trees on citronelle stocks more than those on sweet orange.

Looking through the block many citronelle trees could be seen that showed the thin, bronzed foliage typical of boron poisoning.

Besides showing better health and increased yields, sweet orange trees have produced higher-quality fruit. An analysis, which is done on samples of fruit from every picking, has repeatedly shown fruit from trees on sweet orange to be higher in juice content, sugar, acid, and vitamin C, to have thinner rind, and to hold its quality longer than fruit trees on citronelle.

Because of its lower acidity, fruit from trees on citronelle is marketable earlier in the season and may, for this reason, be useful to those growers who aim at the early market.

Throughout the trial, one-half the trees have been picked early in the season, and the other half have been picked late. So far, no differences in yield can be traced to these two treatments.

In 1944, fertilizer plots were superimposed on the trial. All trees now receive sulphate of ammonia (8 lb. per tree), one-third of these receive 12 lb. of superphosphate per tree, and one-third receives 12 lb. of superphosphate plus 4 lb. of potash. No definite response to superphosphate or potash has been detected, though trees receiving the complete fertilizer have produced fruit slightly better in quality than the other trees.

The 1949 Trial

The sweet orange stocks used in the older trial were raised from large, common orange trees growing on Mr. Symons' property at Merbein. By 1948, it had become apparent that this stock was, under the existing conditions, the superior rootstock.

Would other strains of sweet orange prove to be superior to Symons' strain? To answer this question, the new trial was laid out in 1949, using four scion varieties on nine strains of sweet orange stock. These strains were selected from outstanding sweet orange trees growing in different parts of the State. Over 400 trees are planted on a good "Murray sand ridge" provided with overhead irrigation.

Scion Varieties

1. Washington Navel—Symons' buds.
2. Leng Navel.
3. Valencia Late—(Newton's buds from Halhed).
4. Leng Sport Valencia.

Although the trial is still in its infancy, and present trends could alter in the next few years, the following observations have been made.

Trees are growing well on all stocks.

Varieties

Leng Navel is more vigorous than the standard Washington Navel. The two Valencia strains are equal in size.

Rootstocks

The strains that have produced the most vigorous trees with each scion variety are shown below.

Scion	Best Stock
Washington Navel ..	Jaffa, Henshall's
Leng Navel ..	Foster's
Valencia Late ..	Hill's, Cox's
Leng Sport Valencia ..	Symons', Cox's

KEEPING ORANGES LONGER AND BETTER

Mr. G. B. Tindale, Cool Storage Research Officer, discussed the recent work aimed at delaying the onset of moulds during storage.

Normal Mould Attack

All oranges when picked go through a series of changes. Firstly, the living processes slow down, for a while the flavour improves and juice content increases. With longer storage, flavour decreases and off-flavours develop. Mould attack cannot be halted, and the orange has reached the end of its storage life. This process is natural, the length of life varies with the district and the time of picking. Mildura navels picked in June have a normal storage life of three months, those picked in July approximately two months, and those picked in August only one month.

Accidental Mould Attack

Due to a variety of causes, oranges may be attacked by moulds long before their normal storage life is complete, and each orange attacked rapidly infects its neighbours, and sets up a nest of mould. Three or four infected fruit can soon cause moulding in a third of the oranges in a case.

This year, trials have been carried out using three different methods to combat this early onset of mould :—

(1) Dipping oranges in fungicidal dip ;

(2) The use of fungicidal wraps ;

(3) The use of very low temperatures in storage.

Results of tests using Brytene wax emulsion as a dip and diphenyl impregnated wraps showed that both these methods gave an excellent control of mould, confirming the results obtained in 1952.

If oranges are held at a temperature of 32° F., moulds cannot develop. But, at this temperature, skin injury and off-flavours develop rapidly ; the cure may be too drastic. Experiments have shown that the maximum period navels can be stored at 32° F. without disorders developing is of the order of two weeks. When removed from storage, these oranges were subject to more rapid deterioration than fruit stored at higher temperatures. It seems that the use of such low temperatures will be very limited.

Temperature of Storage Trials

Mildura navels were stored at 35° F., 40° F., and 45°F. ; 40° F. proved the best temperature. Initially, mould development was least at 35° F., but, after several weeks, low temperature disorders appeared and, thereafter, mould attack was greater than at either of the higher temperatures. No low temperature disorders were recorded at 40° F., and mould development was less than at 45° F., but the flavour and colour were inferior.

RED SCALE, "CITRUS PEST NO. 1"

During the morning an inspection was made of the red scale control plots at Red Cliffs, where Mr. C. R. Johnston, Entomologist, described the year's experiments.

Fumigation is still the most effective single treatment with parathion and white oil sprays about equal. At present, the cost of parathion, four times that of oil, limits its use ; it has an advantage in that it can be used at any time except for periods of one month before blossoming and harvesting. Recently gazetted regulations (see page 464, Journal of Agriculture, October, 1953) require the wearing of protective clothing when handling parathion.

Orchards with heavy scale infestation cannot be cleaned up with a single treatment or even in one year.

Results of treatments of a heavily-infested block for three years are shown below :—

Oil + fumigation, 99·7 per cent. scale-free fruit ;

President of the Mildura District Citrus Growers' Association, Mr. E. Keenan, addressing the gathering.

Mr. C. R. Johnston, entomologist, discussing red scale control experiments at the field day.

Double fumigation, 97 per cent. scale-free fruit;

Double oil spray, 94 per cent. scale-free fruit.

While double fumigation has given the best results, it is not advised that growers should rely solely on a fumigation programme. An oil spray every two or three years will reduce the chances of gas-resistant strains of scale increasing.

SUNDRY PESTS

Mr. R. Roberts, Mildura Orchard Supervisor, discussed routine pest control in the citrus grove.

Yellow scale has crept into the citrus groves in the past few years. A good red-scale programme should control this and, if white oil sprays are used, will also control the soft-bodied scales—Olive, Soft Brown, Citricola, and Cottony Cushion.

Many of the insect pests and fungal diseases are not common in the Mildura region, but should not for this reason be treated lightly. Given favorable conditions they can, in the absence of a control programme, build up and cause serious damage. Such troubles include Citrus White Fly, Dark Weevil, Holy Cross Bug, Red Mite, Septoria Spot, Anthracnose, Brown Rot, and Collar Rot.

The black citrus aphis, which has built up in recent years, demands particular respect, for not only does it destroy the young shoots, but it is an agent in spreading the viruses that cause bud union decline and stem pitting of grapefruit.

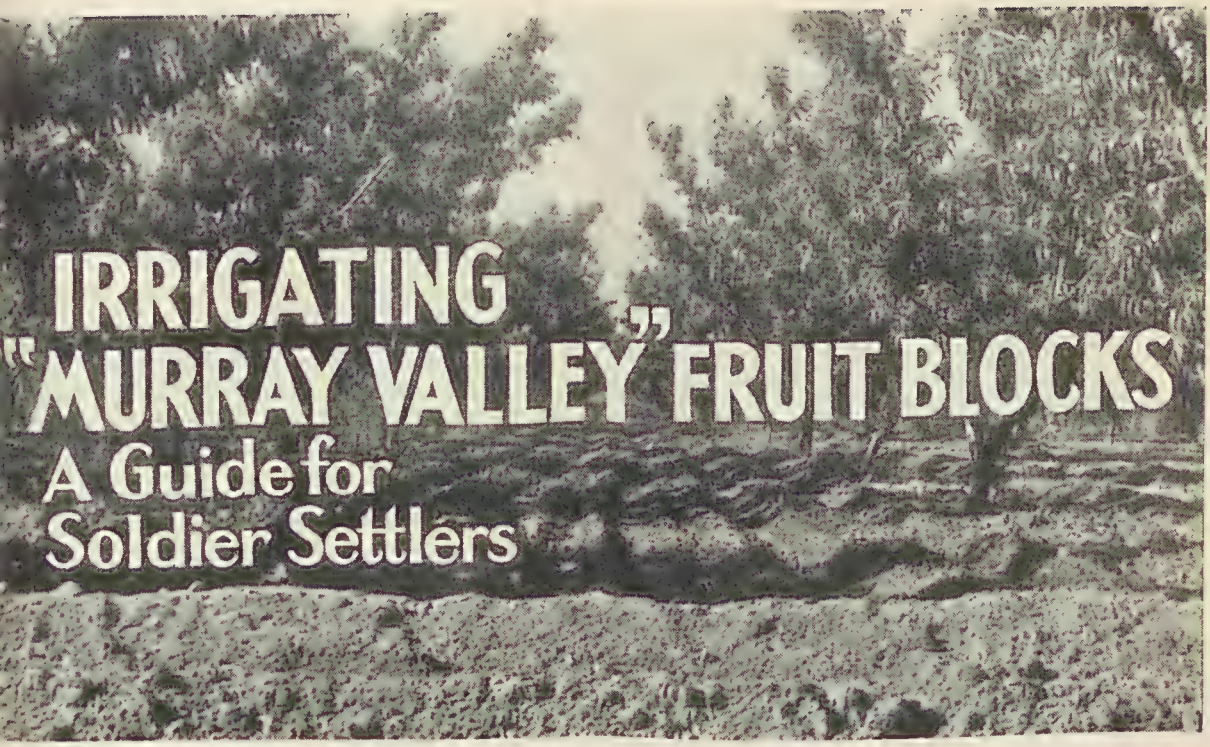
PACKING CAN BE BETTER

Mr. W. Harris, Fruit Packing Instructor, claimed that, based on observations he had made while travelling through Victorian country centres recently, the citrus grower was neglecting the provincial market. Citrus production is expanding, and slip-shod methods of packing must cease if sales are to expand in these centres and in the city markets. It was suggested that some type of packing material should be placed on each inside surface of the cases to eliminate much of the damage now being caused by the use of rough, wooden, fruit cases.

There is also a tendency to pack fruit too large for a given count creating an excessive bulge and resulting in distortion of the fruit in transit. Some fruit recently seen on the Victorian market were almost cubic.

Sometimes a false height to the finished case is created by not placing the fruit correctly. Oranges should be individually placed in cases and packed firmly. There is always a possibility of excessively high fruit being cut or bruised by the nailing press.

During the afternoon, an air-blast sprayer developed by the Aeronautical Division of the Commonwealth Department of Supply, was demonstrated to visitors by the designer, Mr. L. White.



IRRIGATING "MURRAY VALLEY" FRUIT BLOCKS

A Guide for Soldier Settlers

By M. W. JARVIS, D.D.A., Field Officer and K. B. HIGGINS, B.Agr.Sc., Horticultural Instructor.

The Murray Valley soldier settlement area north of Numurkah provides a challenge to the irrigator. Here are young orchards which have been carefully planned and planted, using the most modern methods, to give the fruit trees the best chance and to make irrigation as easy as possible.

But it is still up to the grower to irrigate *with care* to ensure that this becomes, and remains, a highly productive fruit district. A little extra thought and work now will save much worry and perhaps serious losses later on. Growers are urged to take a pride in keeping their district out of the difficulties older irrigation areas have suffered.

The information given here will guide growers to safe irrigation, but they should not hesitate to ask Department of Agriculture officers for further assistance if it is required.

HOW THE FRUIT BLOCKS WERE CHOSEN

THERE were two stages in the selection of fruit blocks. *Firstly, a soil survey* by the C.S.I.R.O. and Victorian Department of Agriculture described and mapped the soil types. A comparison of these soil types with similar soil types in established fruit-growing districts resulted in the selection of the following as suitable for fruitgrowing:—

Sandmount Sand for citrus, or any other fruit. *Cobram Sandy Loam, Cobram Loam* and *Waaia Loam* for peaches, apricots, pears, or plums. *Moira Loam* for pears only.

Suitably located areas of these soils were set aside for fruit blocks. All other soil types were regarded as unsuitable.

Secondly, a permeability survey of each of the fruit blocks selected by the soil surveyors was carried out by the Department of Agriculture, because any one soil type can have important differences in the rate at which water can soak in, i.e., in "permeability," because of its previous farming treatment. These differences are important in irrigating, and also because fruits differ in water requirements—for example, early peaches are easier to bring up to size on a permeable soil than an impermeable one.

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The rate at which the soil absorbed irrigation water was measured at many places in each block. This made it possible to decide what types of fruit it would be best to plant in each part of the block. Some 10 to 15 per cent. of the blocks were rejected because they had too small an area of permeable soil suitable for peaches.

After final selection, modern agricultural engineering technique was used to determine the best direction of irrigation and placing of supply ditches and drains within the blocks. Gradients are usually low enough to allow easy control of water in furrow or flood irrigation.

GOOD IRRIGATION

The aim should be to wet the soil to an even depth, equal to but no more than the depth of the root zone, usually 2 or 3 feet. There are practically no roots in the top six inches of soil because of cultivation, and not many below three feet even under mature trees.

Water is lost from the top 8 to 10 inches of soil by direct evaporation, in addition to that used by the tree roots; but the soil below 12 inches is dried out only by roots. It will not dry out by drainage.

Water which penetrates below the root zone cannot be used by the trees and is wasted. Further, this waste water gradually raises the water table.

WATER TABLES ARE DANGEROUS

There are two types of water table :—

1. The District Water Table

The district water table, at present varies between 60 and 80 feet from the surface over the greater part of the newly-settled fruit area. On a few places the level is between 30 and 40 feet. The average rise in the water table over the area has been approximately 4 feet per year, but in some places it has been as great as 8 feet per year. These figures indicate no immediate danger, but if careful irrigation is not practised and the annual rise persists, this water table will eventually be near the surface and thus of great importance, especially where it contains high salt concentrations. Tests made on water gathered from it indicate in some cases that very high salt concentrations are actually present. Although salt is not as common in soils of this part of Victoria as it is in the soils of the lower Murray Valley districts of Swan Hill and Mildura, the danger is still there. In fact there has already been an instance where a fruit block has been salted out and two other proposed blocks rejected partly on this basis.

2. A Perched Water Table

A perched water table is built up on an impermeable cemented or clay layer underlying a more permeable zone of soil. This type

The type of stop (above) is suitable for permanent supply ditches.

Head ditch (right) showing pipes into furrow and the common bag stop.

of hardpan is known to occur at a depth of 3 feet in the soil known as Katunga Gravelly Loam and hence very careful irrigation should be practised on it. Perched water tables can be built up very quickly, and are an immediate source of danger to trees.

It would be foolish to think that if high water tables do occur, tile drains will be an easy answer to the problem. They are very costly to install, particularly with the close spacings necessary in most of the Settlement soils and the absence of natural outlets for drains. They could well be uneconomic.

YOUR JOB AS IRRIGATOR

Too little water will result in stunted trees and perhaps undersize fruit, but it will not kill the trees. Too much water may give good results for a few years, but there is a grave risk of building up a water table, killing the trees and salting out the land.

Your job—and it isn't easy—is to find the happy medium and water so that the root zone is thoroughly wetted as often as the trees need it. Using more water than that is dangerous.

The permeability plan of his block issued to each grower by the Department of Agriculture is a very valuable aid to proper irrigation. A typical plan is reproduced in Figure 1.

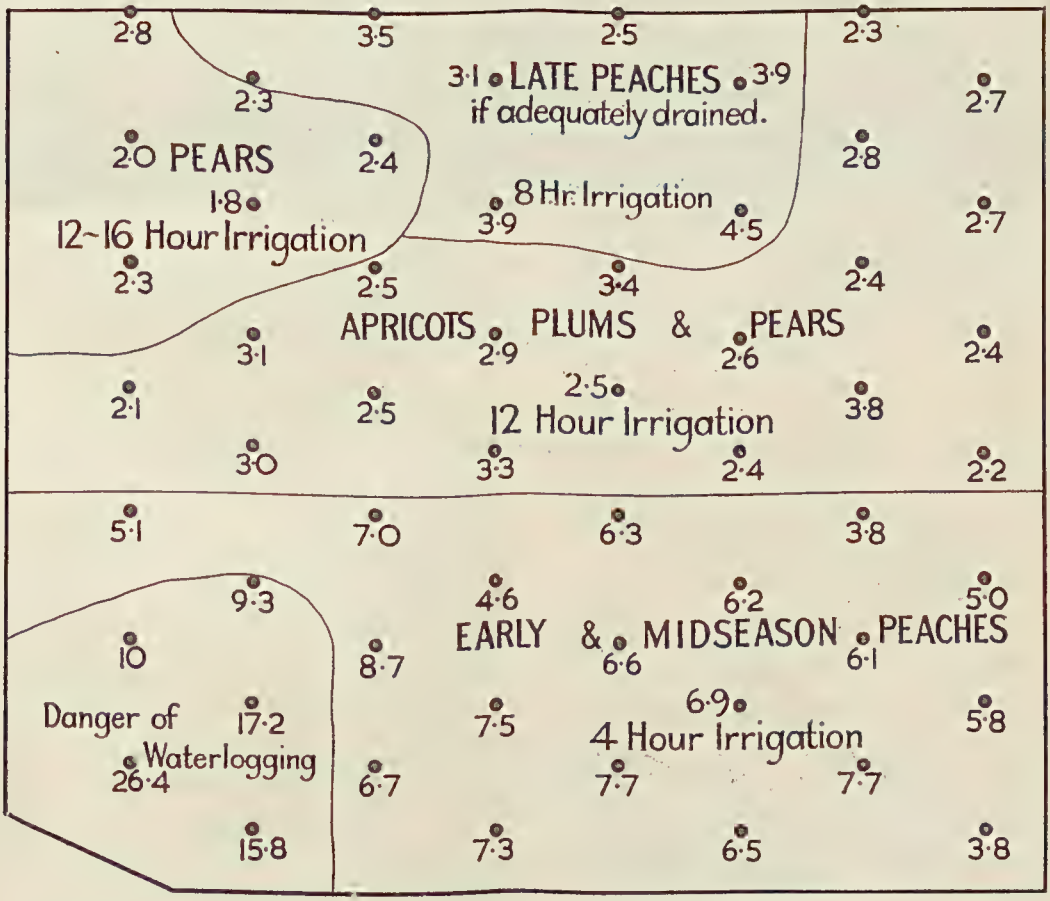


Fig. 1.—Permeability plan of an orchard block. The figures on the plan are the "5-hour values".

Type of irrigation layout which could be suggested for this block is :—

4-hour irrigation area—Furrows, either V or broad base depending on lateral soakage obtained.

8-hour irrigation area—V furrows.

12, and 12 to 16-hour irrigation area—Flood irrigation, basin or border check depending on slope.

Water penetration is checked with one of these tools—the probe, the Jarrett auger or the core auger. The augers are also used for examining the soil to ascertain whether an irrigation is due. The probe is a 3-foot length of ⅜-inch diameter steel rod marked off in inches, with a handle welded across the top forming a "T". When pushed into impermeable soils the probe will sink in only as far as the soil has been wetted, giving the depth of penetration. The core auger is made from a 1-inch wood auger by removing the centre worm and welding a 3-foot shank and handle on to it.

The figures on the plan are the "5-hour values"—i.e., the number of surface inches of water that would soak in at that point during a 5-hour irrigation. The following table shows the time water must be held on to wet the soil to 3 feet in depth:

"5-hour value"	*Time of Irrigation*
2 to 3 inches.	approx. 12 hours
3 to 4 ,,	approx. 8 hours
Over 4 ,,	4 hours or less

In this way the average time that water should be held on each patch of trees, can be decided. If a study of the map is made, it will be seen from the figures where too much or too little penetration may be expected, and irrigation practice can be varied a little to get the right watering in those spots.

The rate at which the soil absorbs water will vary to a small extent during a season and from year to year, but if the penetration and time taken to irrigate is checked regularly this variation can be allowed for. Also, old furrows do not take water as readily as freshly-cultivated furrows, and watering times must be adjusted accordingly.

Checking Penetration

Check the depth of penetration two days after irrigation with one or more of the tools illustrated—the probe, the core auger or the Jarrett auger. For permeable soils the core auger is quick, suitable and cheap, although not quite as good as the Jarrett auger. The probe is suitable for impermeable soils where the depth of penetration is not greater than 18 inches.

The Jarrett and core augers are screwed into the soil and the soil brought out with the auger is worked between the fingers. Boring continues until the sample taken crumbles in the hand. The borderline between the stage of binding and crumbling is the depth of wetting or penetration.

When pushed into impermeable soils the probe will only penetrate wet soil, and cannot be pushed into the lower dry soil. Thus the depth it can be pushed is the depth of penetration.

Measuring fruit circumference with a flexible steel tape.

Check the penetration in several places in each section of the block. If the depth of wetting is fairly uniform in a section, but is more than 3 feet, it means the water has been on too long. It is, therefore, necessary to cut down the time at the next irrigation and check penetration again. Try different times until a wetting of 3 feet is obtained.

WHEN TO IRRIGATE

Time of watering is a most important factor, especially in soils where difficulty is experienced in bringing fruit up to size. The soil should not be allowed to dry out so much that the leaves wilt. By that time the fruit has stopped growing for a few days, and may even have shrunk a little. It will not resume growth until the soil is wet again, and even then the loss of growth in the fruit cannot be regained. This would only need to happen two or three times during the season to seriously affect size and reduce yields.

This condition is arrived at much quicker on impermeable soil types due to the smaller amount of moisture which is absorbed and conserved within the soil. Irrigations must be frequent enough to prevent it, but too frequent watering may result in surface waterlogging or high water table. Obviously the time between irrigations will vary with the soil permeability and with the weather. How can this best be determined?

1. By Fruit Measurement

There has been a large amount of research work done in the past few years to find a quick and easy method of accurately timing irrigations. It has been found that very satisfactory results for peach trees, which are the most difficult to handle, can be obtained by measuring the circumference of a few fruits in each block with a flexible steel tape measure and irrigating when fruit ceases to grow.

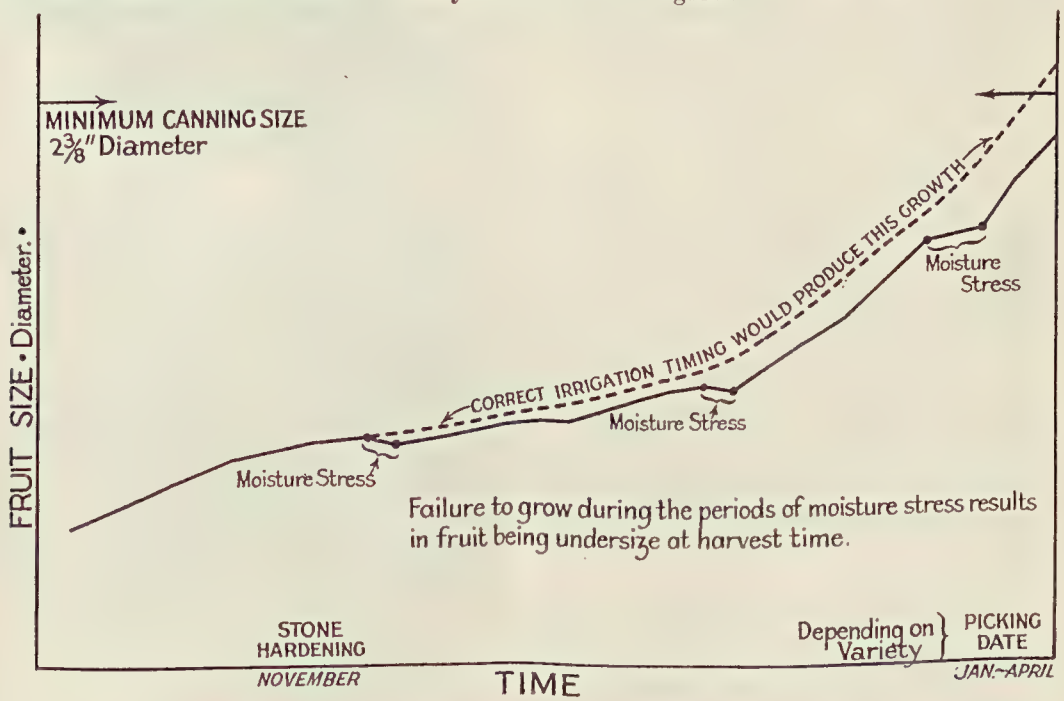
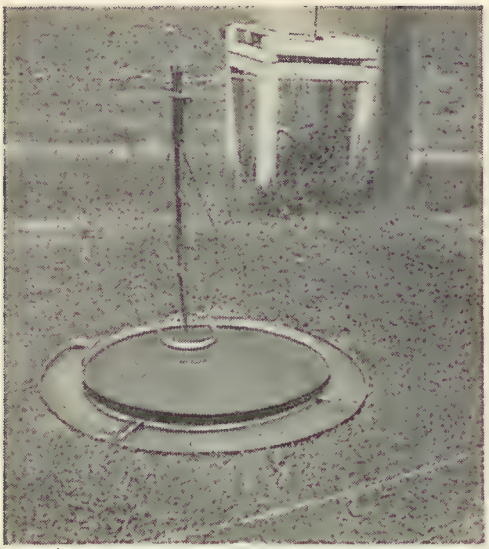


Fig. 2.—Fruit growth graph showing how fruit fails to reach canning size if irrigation timing is faulty.



The Standard Evaporimeter records rate of evaporation. It may soon be possible to advise when to irrigate, using information obtained from this and other similar weather instruments.

The Department of Agriculture has used the method of fruit measurement on the Tatura Research Station with excellent results, and to advise a number of Goulburn Valley growers when to irrigate. This has enabled them to get fruit up to size on soil types where this was not previously possible. On one orchard the yield was increased from 7 tons with 20 per cent. under size, i.e., below $2\frac{3}{8}$ inch diameter, to 11·7 tons with 2 per cent. under size in three seasons.

The method is easy. Tag and number a dozen or so fruits through the block. Measure them every three days and record the circumference of each one. Measurements need not be taken for about five days after an irrigation. When more than half the fruit ceases to grow, water the trees as soon as possible.

During stone hardening (November), and for a period thereafter, depending on the variety, there is only a very small increase in fruit size. The best way of making sure of the need for water during this period is to wait until 90 per cent. of the fruits stop growing, but do not leave it till they begin to shrink.

The relation between fruit growth, soil moisture, and evaporation data is being studied, and it is anticipated that with this information it will be possible ultimately to give advice on irrigation timing for all orchards in the Goulburn Valley districts, without the necessity for continuous fruit measuring.

2. By Soil Examination

Soil examination is a less reliable method but is the best available when there is no fruit on the trees, or for apricots or pears.

Start testing the soil some days before an irrigation is expected, usually when the surface soil dries out, and continue at two or three day intervals. In each block of fruit, usually about three acres in area, bore holes near the head, middle, and foot of the run in at least two separate rows. After a number of irrigations, when the block's characteristics are well known, the number of points tested can be reduced.

A 4-in. Jarrett auger is best, but other types of auger can be used. Bore to a depth of 24 inches, taking note of the soil moisture in the 6 to 24 inch range. Take a small sample from each fill of the auger, and work it between your thumb and forefinger. If this sample can be kneaded like plasticine without breaking up or crumbling, the soil does not need to be irrigated.

Examining soil from a Jarrett auger. If the soil breaks up or crumbles when worked between the thumb and forefinger, an irrigation is due.

The ideal time for irrigating is when the subsoil is between the stage of binding together and crumbling.

IRRIGATION METHOD TO USE

Spray Irrigation

Spray irrigation is a costly system to instal, but necessary on very permeable soils, e.g., Sandmount Sand, for crops such as citrus. It is not used in the Murray Valley Soldier Settlement area at present.

Furrow Irrigation

Furrow irrigation is the most suitable form of watering the permeable soils of the area, i.e., Cobram Sandy Loam, Katunga Gravelly Loam and the more permeable phases of Cobram Loam and Waaia Loam, or those areas on the infiltration map with a 5-hour value of 3 or more surface inches. Sandmount Sand may be furrow irrigated only if great care is used—broad base furrows should be used in this case.

Flood Irrigation

The flood type of irrigation is recommended for Moira Loam, Boosey Loam, and the less permeable phases of Cobram Loam and Waaia Loam, i.e., where the 5-hour values are less than 3 surface inches. Usually these soils are planted with pears, apricots and plums. The system is not suitable for very young trees, but should be commenced in the fourth year.

NOTE:—It is likely that in 7 to 10 years after planting, the more permeable phases of Cobram Loam and Waaia Loam may become less permeable under cultivation to such an extent that the flood method of watering will be required.

FURROW IRRIGATION

Furrow irrigation gives good control of the water, but because it is used mostly on the permeable soils, special care is needed to avoid waterlogging. Here are the main controls to enable such care to be exercised:

Length of Run

Highly permeable soils, not more than 4 chains.

Moderately permeable soils, up to 6 chains.

Number of Furrows

The best procedure is—

1st year in orchard, 2 furrows (one each side of tree);

2nd and 3rd year in orchard, 4 furrows (two on each side of tree);

4th year onwards, furrow right out (5 or 6 furrows).

N.B.:—Never attempt to "black out" the surface by holding water in the furrows longer than the time required to wet the soil 3 feet deep. If the surface doesn't wet in that time, *use more furrows* or broad-base furrows.

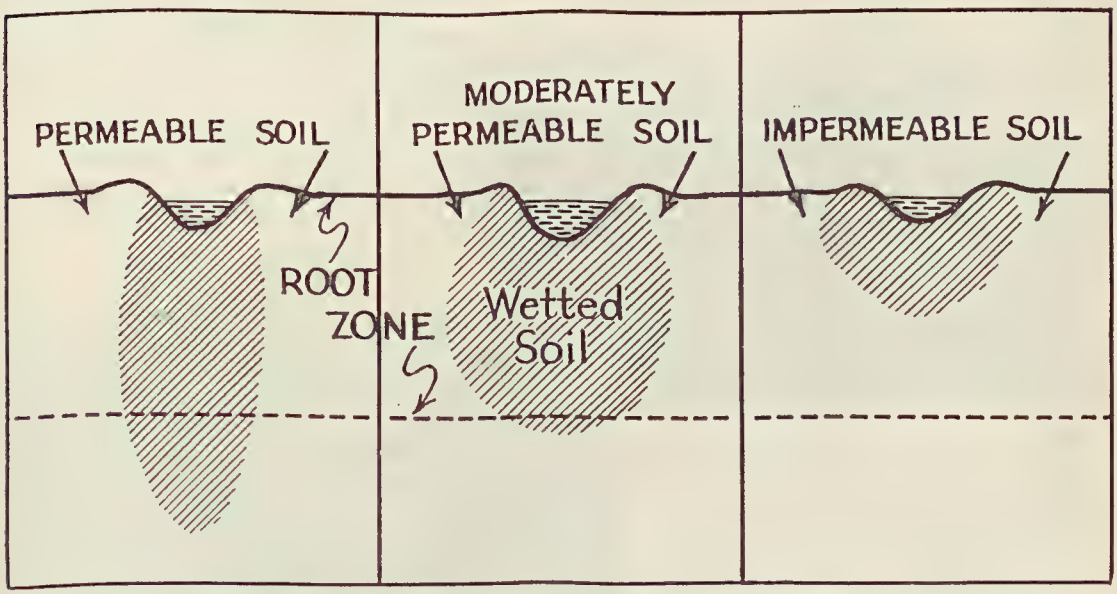


Fig. 3.—Cross sections of furrows showing the wetted area in soils of three different permeability classes, after a 5-hour furrow irrigation.

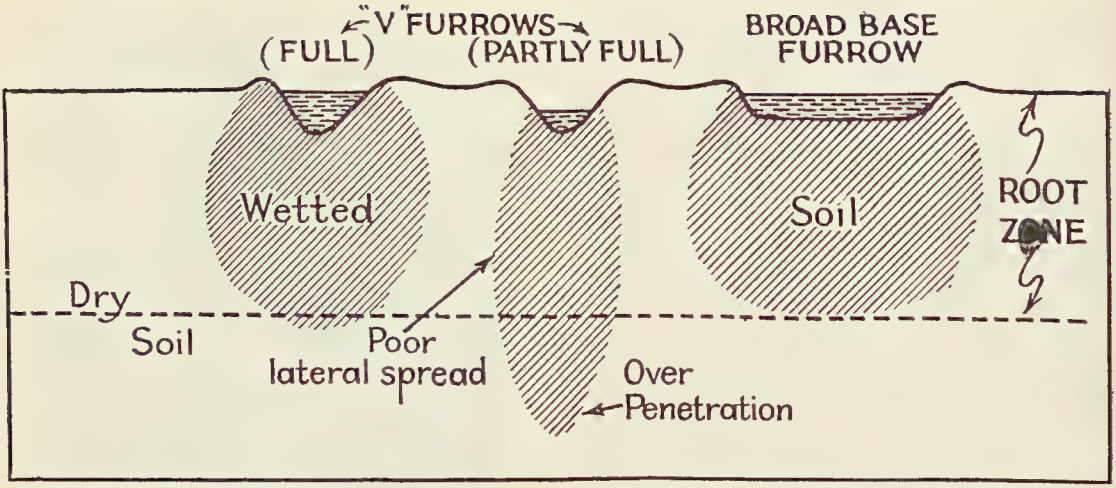


Fig. 4.—Furrow cross-section showing wetted areas. A full V-furrow or a broad-base furrow, gives good penetration and lateral spread. A partly-full V furrow (centre) gives poor lateral spread and, if irrigation is continued too long, over-penetration occurs.

Type of Furrow

V-furrows are suitable for moderately permeable areas especially on flatter grades. *Broad base furrows* are best for high permeability areas and give good lateral spread of water. They wet a large proportion of the area watered by direct contact, and a good even penetration can be obtained without the soaking required in V-furrows to get the desired lateral spread. With broad base furrows, big flows are essential; when the flow has reached the foot of the run the stream can usually be cut off and no secondary or soaking stream is required. They should produce good results where Cobram Sandy Loam or Sandmount Sand occurs in conjunction with steep slopes, provided the furrows run across the slope or in a direction that gives a moderate grade.

Typical dimensions are :—

V-furrow—top width 12 to 15 inches, depth 9 inches.

Broad base furrow—top width 18 to 24 inches, bottom width 12 to 18 inches, depth 6 inches.

The 3-furrow implement (below) is suitable for furrowing "right out" (six furrows in two runs between the rows of trees).

The half-furrow shoe on the tool-bar (above) cuts a small furrow and throws the bank away from the tree-line. Water can be allowed to spread out of the furrow to cover the soil between the two furrows on either side of the trees. This furrow is suitable for trees in their first year.

Condition of Furrow

Condition of furrow affects the rate of advance down the furrow and so the evenness of depth of wetting. Furrow can be made smooth or rough to alter the rate of advance down the furrow, where it is necessary to cope with special problems.

Depth of Water

It is desirable to keep the furrow full to get even watering and good lateral spread on flat slopes. (See Fig. 4). Use more furrows on steep slopes where a full furrow is not possible, or use broad base furrows.

Don't attempt to "black out" the surface by holding water in the furrows for a long time—most of the water goes downwards and will raise your water table.

Grade

The grade should be about three inches and not more than six inches per chain and even throughout each run. Alteration of grade within the run causes uneven watering.

Rate of Flow

Rate of flow is the easiest of the conditions to adjust on the spot, but doesn't solve every irrigation problem. It is affected by the size of outlet from the head ditch, and depth of water above the outlet. Keep your eye on both of these when irrigating.

The usual and simplest method is to irrigate with a constant rate of flow—that is, to use a medium flow until the furrow is almost filled to the bottom end, then cut right off. It is satisfactory for moderately permeable soils on grades under 6 inches to the chain.

The other method is to use a high initial flow to fill the furrow quickly, then cut, back to a flow just sufficient to keep the furrow full until the soil has been wetted to the right depth. You handle fewer furrows at a time, but handle them quicker. It is specially suited to permeable soils. Furrow grades should not be more than 4 inches per chain for this method.

Run trial flows at different rates and then check penetration with the auger and lateral spread by digging a trench across two furrows with a shovel.

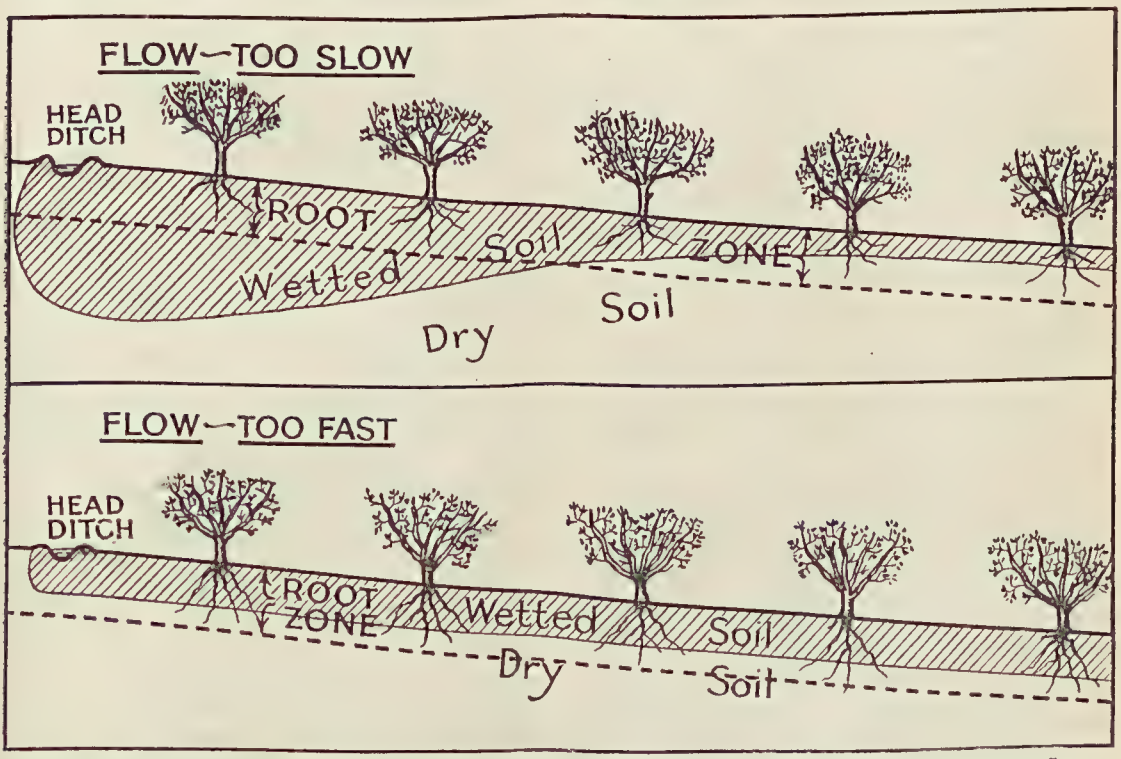


Fig. 5.—Section along a furrow. The top diagram shows the uneven penetration obtained with too slow a flow, while the lower diagram shows how the penetration is even but but too shallow when the flow is too fast.

SOME DIFFICULTIES OF FURROW IRRIGATION

1. Overwatering

Never use more than 6 surface inches for any watering—a far safer limit would be 4 surface inches. If using more, the first thing to do is to cut down the time of watering till about 4 inches are used. Then check penetration for evenness.

2. Underwatering

If depth of penetration is even, but less than 3 feet, try holding the water on longer next time. If less than two feet after an 8 hour irrigation, switch to flood irrigation on grades less than three inches per chain.

3. Uneven Watering

Check the penetration from head to foot of typical runs two or three times a year. This will tell whether the best rate of flow in the furrows is being used. What happens is shown in the diagram of sections along a furrow. (Fig. 5).

Too small a flow will give deep penetration, i.e., overwatering, at the head of the run, while the foot of the run may be under-irrigated.

Too large a flow gives shallow but even penetration with flooding of the foot of the run. The correct rate of flow can be determined by running trial flows, but continue to check the penetration at intervals along the furrow for a few furrows in each section at every irrigation, because the permeability of the soil decreases a little from spring to autumn and also year by year under ordinary management.

This checking means extra work for the irrigator, but it must be done. It's part of the job of irrigation—to see that the penetration is even and to the right depth. You can't tell from the top!

4. Change of Slope or Permeability in Run

Possibly one of the greatest causes of a water table build up is a variable slope, especially where a moderately permeable or impermeable slope runs out onto a flatter permeable grade within the same run. The water runs over the slope quickly and soaks into the permeable flat. If water is applied at a rate to suit the permeable area the slope is under irrigated; if to suit the impermeable slope, the permeable area will soon be waterlogged. Splitting the run by putting in an intermediate head ditch or pipe line is the best solution. If this is not possible, the problem can be got over to a large extent by firstly running a good cross-check between the two areas, and other cross-checks at intervals up the slope. Water by applying a large flow to suit the permeable area, through openings in the checks, then closing the main cross-check and slowing the rate of flow down to finish off the slope. Cross-checks further up the slope can then be closed one by one.

A cross-check is simply a check bank thrown up at right angles to the direction of watering. It is used to retain a depth of water on the slope above it.

Where the opposite condition of running water through the permeable area to reach the impermeable area exists, the main point to make sure of is that there is sufficient flow to get over the permeable area quickly, using smooth furrows, and at the same time filling up between cross-checks on the impermeable area. Alternatively, fewer furrows can be used on the permeable soil, dividing them when they reach the impermeable soil, i.e., irrigate all furrows through both areas until the desired penetration is almost obtained on the permeable area; then run the water through two furrows across the permeable area dividing it into all furrows on the impermeable area. As before, the best remedy is to split the run where practicable.

Condition of the furrow also can be altered to meet special problems such as steep slope in a run or part of a run. For permeable soils and gentle grades use smooth furrows—eliminate clods and other obstacles which can impede the flow down the furrow and cause overwatering. For less permeable soils and steeper slopes, a rough cloddy furrow increases penetration by slowing the rate of advance of water along the furrow. Weedy furrows also increase water soakage because they slow down the rate of movement of water along the furrow. During the spring period it is often impossible to get really clean, smooth furrows especially where there has been a dense cover crop. To get clean furrows at this stage do not plough deeply when discing in the cover crop—only deep enough to chop down the crop. It should then be comparatively easy to make clean furrows with a disc implement.

Pears irrigated by the border-check flood system.

Later in the summer, smooth, clean furrows are easier to obtain especially if a smoothing or cleaning implement is used. A simple type of smoother is a piece of concrete pipe, filled with cement, dragged along behind the furrower. Not only does it smooth the furrow, it also compacts it, which is an advantage in permeable soils.

5. Erosion

This is likely to occur on steep slopes particularly where light soils occur. In these conditions heavy rain or large irrigation flows can cause serious damage. To prevent erosion during irrigation the velocity of the flow, i.e., the rate of advance, must be lowered.

This can be done by changing the direction of watering to give a lower gradient, by following a system of reasonably "dirty" culture encouraging weed growth and cloddiness, or by using smaller rates of flow.

Erosion occurs more easily in V-furrows than in broad base furrows.

6. General

The factors outlined in this section on furrow irrigation must be continually kept in mind, the main ones being to watch the penetration and use the right flow rate. If this is done, waterlogging by overwatering or stunted trees by under-watering, will not occur as it has done in parts of the Goulburn Valley.

FLOOD IRRIGATION

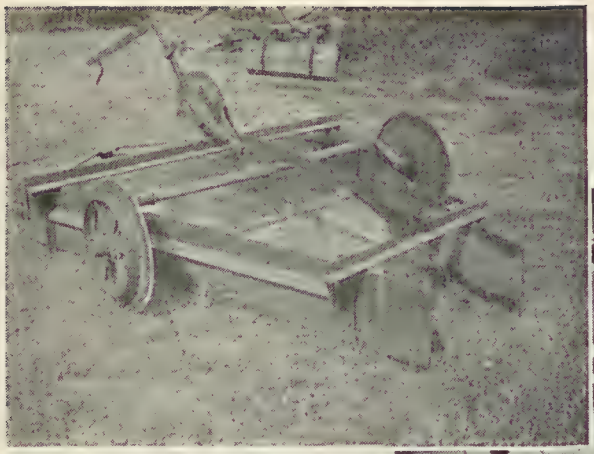
The flood method of irrigating is for use mostly on impermeable areas where it is seldom possible to wet the soil to 3 feet deep, even though the water is held on for 2 or 3 days. The maximum possible storage of soil moisture is gained because the full width between rows is thoroughly wetted to the depth of penetration, whatever it may be. Nevertheless, more frequent waterings may be needed in such soils, because it is the amount of water available to the roots that affects the irrigation interval, and shallow wetting means less water available.

When flood irrigating always use a big flow of water into each bay.

There are two main systems of layout for flood irrigation.

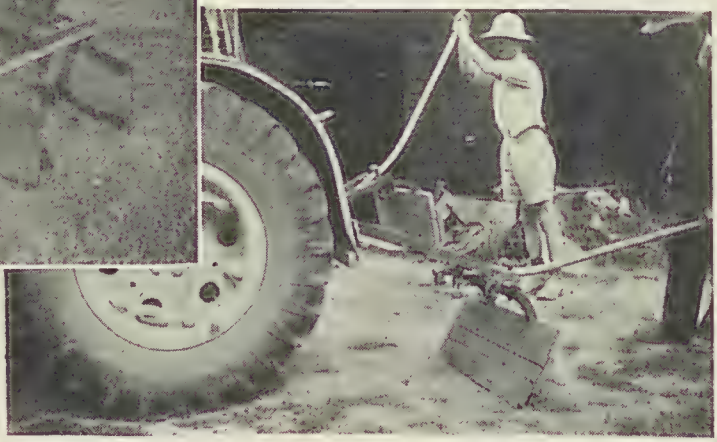
1. The Border-Check System

This is the simplest flood irrigation system to prepare and is used where slopes are less than 2 inches per chain. A bank is thrown up either along each tree line, or down the centre of each row, and each bay so formed is flooded with water, using a big flow. Some judgment is necessary in cutting off the flow before the water reaches the end of the bay. Too early means dry soil at the end; too late means overflow, waste water, and drainage problems.



The crowder (left) can be used for throwing up check-banks.

A cross-check banker (lower) is used for reforming banks after a cross-check has been put in with a crowder or grader.



2. Basin-Flooding System

The basin system is particularly suitable where slopes are two or three inches per chain. A check-bank is formed down the centre of each row and a cross-check is thrown up between every second and third tree for the length of the run. This forms two-tree paddocks or basins. For the first irrigation they are closed off one by one working from the foot of the bay to the head as each one fills. For later irrigations when the banks have consolidated, the cuts in the cross-checks can be adjusted (with a little care) so that as the basin at the head of the bay fills, it overflows into the next, and so on. This would mean very little shovel work being required. The basin system may require a little extra trouble in setting up, but is a good method whereby the effects of poor penetration on steeper slopes are reduced. On no account should the cross-checks be left standing after March or April, depending on variety, because they would interfere with surface drainage if heavy autumn rains fell.

SOME DIFFICULTIES OF FLOOD IRRIGATION

1. Grading

The success of flood irrigation depends on careful grading. The grading should be carried out before the season commences and check-banks installed after grading if banks run down the centre of the row. When the banks are on the tree line, throw up the banks first, then grade, then put in any cross-checks needed.

Without perfect grading, flood irrigation is hopeless. Even distribution of water cannot be obtained, and there is considerable danger of surface waterlogging in the low spots.

2. Surface Waterlogging

The problem of surface waterlogging is confined to poorly graded and poorly drained impermeable or moderately permeable areas. It means that the surface foot or so of soil has become saturated with water, and the roots there will be killed. This condition caused a large proportion of the death of Goulburn Valley trees during the wet winters of 1950–1952.

The best means of preventing surface waterlogging is to have good grading, and especially throughout the winter months adequate surface drainage. Low spots which can cause damage in the summer should be graded out. It is sound practice to plough up to the tree in autumn, leaving a clear furrow down the centre of each land. Each furrow should lead into a drainage ditch with a good outlet.

Some growers do not like the idea of drainage ditches and furrows in the winter because it usually means some shovel work to get the spray pump into the block. They should remember that all trees lost because of surface waterlogging reduce the value of their blocks and take a long time

to replace. The area affected in one season can be very large and the economic loss considerable. Trees rarely recover from water damage to their roots.

3. Water Tables

Water tables are rare in soil types which are flood irrigated, but if they do occur change to furrow irrigation.

4. Weeds Along Check Banks

Banks on the tree line may require a light cross cultivation once a year to keep weed growth down. Provided the banks have consolidated they are not cut up seriously by this cultivation and can be repaired by a little shovel work. Sometimes however, it may be necessary to throw up the banks again.

Cross-checks are easily thrown up again if broken by cultivation.

5. Getting Implements Over Crosschecks

Cross-checks thrown up by grader, crowder or grading board are easily crossed by spraying outfits and lorries.

However, cross-checks formed by disc ploughs have a sharp furrow on either side of the bank and it may be necessary to cut them down before harvesting.

Other Systems of Irrigation

Besides furrow and flood irrigation, there are other systems which can be used to meet special difficulties. If you cannot get satisfactory results with furrows or flooding ask for a Departmental Officer to help you—one of these other systems might solve the problem.

CULTIVATION

Finally, a word on cultivation, which should be started early in the spring to get rid of the winter weeds or green crop before the trees start to grow. It need not be a deep ploughing. Discing is often enough. In young orchards the block should be disced both ways. Don't work the soil down fine because at this stage there is too much risk of washing by thunderstorms, as happened during November, 1952. Also, the more cultivation you do, and the finer you break up the soil, the sooner you will have difficulty getting enough water into it.

About the end of November or early in December there is usually a free germination of summer weeds. Under irrigated conditions this crop of weeds can be let grow or disced in as desired. If disced, there is shortly afterwards a second germination of weeds which can be let grow till harvest when they can be either mown or disced.

The block should be ploughed up to the tree in March and the cover crop sown, or the natural weeds allowed to grow with the aid of a superphosphate dressing.

Never cultivate while soil is wet—this is the surest way of spoiling its structure and reducing permeability.

MISCELLANEOUS HINTS

1. Stunted Trees

Stunted trees generally indicate poor penetration of water during irrigation. It is usual to find them on slopes of low or moderate permeability. Quite often the best way to correct this is by holding

Left.—Surface waterlogging caused the decline of these peach trees in a Goulburn Valley orchard.
Right.—Trees killed by rising water table at the head of a row. A test-well can be seen in left foreground.

Water lodging in a low-lying area after heavy spring rains. Careful grading will overcome this problem.

water on the surface for a longer period. Usually this is only a matter of irrigating at right angles to the original direction. If this is not successful it is necessary to adopt flood irrigation or to put in numerous cross-checks which at first will mean quite a lot of extra shovel work, but later on when the banks settle down will be much easier to handle. If better penetration cannot be obtained by such methods more frequent watering will be necessary.

2. Light Watering

Water does not move through the soil unless the soil is saturated, so a light irrigation wets the top few inches only and does not "dampen" all the root zone slightly as might at first be thought.

3. Night Watering

Reserve sections of the block which water slowly for night irrigation. Water permeable soils in day-time only.

4. Sick or Dead Trees

Look for waterlogging. A few permanent test wells in the block will give an early indication of a rising water table.

5. Signs of Salting

Watch for leaf scorch; greasy soil; or white incrustations on the soil surface.

Class for Herd Testers

A class for the instruction of herd testers will be conducted by the Victorian Department of Agriculture at the School of Primary Agriculture, Burnley, commencing on January 11, 1954. At the conclusion of the class an examination for the herd tester's certificate will be held from January 26 to 29 inclusive. Instruction will be given in the following subjects :—

The principles of milk testing;

The practice and principles of the Babcock test;

Rules governing the association system of testing;

Herd test recording work and the preparation of herd test returns.

Further particulars may be obtained from the Superintendent of Dairying, Department of Agriculture, Treasury Gardens, Melbourne, C.2.

By H. J. SIMS, M.Agr.Sc., B.Com., Cerealist

THE Mallee Research Station at Walpeup was established in March, 1932, when an area of 1,928 acres of Crown land (mostly uncleared) was permanently reserved by the Department of Agriculture to serve as a centre for research and investigation into wheat growing and allied problems in the Mallee. In 1947, the station was enlarged by the purchase of 628 acres of cleared land adjacent to the western boundary of the original reservation, and which has added to the usefulness of the station by providing a larger area of a light, sandy-type of soil. The total area of the station is now 2,556 acres of which 1,600 acres are available for cultivation. In 1953, the area of cereal crops sown was approximately 600 acres. The work conducted at Walpeup is supported by experimental plots in other districts throughout the Mallee.

During the 1920's, farmers throughout the Mallee made many requests for the establishment of a research station to serve the special needs of that portion of the State and, in 1927, the Government approved the proposal to establish a Mallee Experimental Farm, but unfavourable seasonal conditions and financial problems delayed its establishment until 1932.

The advantages and disadvantages of twelve areas in the Mallee were reviewed before the Walpeup site was finally chosen. The factors in favour of Walpeup were :—

(*a*) Its central situation in the Mallee district ;

(*b*) The climatic conditions are average ;

(*c*) The soil of most of the area was virgin and included a range of vegetation types ; and

(*d*) The remaining portion of the area had been under experimental plots for a number of years.

The principal soil types on the station range from medium loams to light sands. The former occur on land which was originally covered with pine and belar, and the latter, which predominates on the western portion of the property, was originally under small mallee, acacia, and porcupine grass. Both of these, as well as other soil types on the station, are very liable to erosion by wind. There are also areas of heavy mallee and limestone soils. The rainfall at Walpeup over the past 42 years has averaged 1,278 points, of which 834 points have fallen during April–October, the normal growing period of cereal crops.

Official opening of the Mallee Research Station, November, 1933.

Following the decision to establish a research station at Walpeup, arrangements were quickly made to commence developmental work on the station, and preliminary work was commenced before the end of March, 1932. Developmental work proceeded alongside experimental work on the cleared portion of the station, and the official opening ceremony was performed at the farmers' field day on 3rd November, 1933.

The developmental programme of the station was greatly interrupted during the 1939–45 war and, at present, a portion of one of the original three blocks remains to be cleared. A feature of the clearing of the station has been the generous reservation of shelter belts. These belts of natural timber are approximately 10 chains wide and divide the two main blocks of the station and, in addition, in the homestead reserve, an area of approximately 130 acres has been left uncleared, and the various farm buildings and houses are located in this area. This precaution has greatly assisted in giving protection to all the buildings.

The main work of the station since its inception has been the testing of wheat and oat varieties and crossbreds, the production of new varieties, the investigation of crop rotation, cultivation, fertilizer, seeding, time of sowing, and disease problems connected with cereal growing. The programme includes experiments concerning the maintenance of soil fertility of cereal-growing land, and investigations on soil-erosion control. An important phase of the station's work is the production and sale of pedigreed seed wheat and oats. The production and distribution of the new varieties Insignia wheat and Orient oats have been of particular importance.

On the pasture and stock side of Mallee farming, attention has been given to the introduction of improved pasture species, including pasture legumes. The work with

Rolling small mallee on the Station.

Timber on Mallee Research Station Prior to Clearing

Left.—Mixed pine and belar predominated on the eastern portion of the property.

Right.—Big mallee.

Left.—Small mallee. On the western portion of the farm the mallee was even smaller, and was mixed with acacia and porcupine grass.

sheep has been directed towards ascertaining the most suitable types of rams and ewes for fat-lamb production. Sheep-management studies have included those of drought feeding and supplementary feeding in lean periods, particularly the autumn.

During these 21 years, a large volume of precise information on Mallee agriculture and its problems has been collected and tabulated. The main features of this work are set out in the guide books of the station, which are distributed at the field days conducted at the Mallee Research Station and at the associated experimental plots at the other Mallee centres. They are also available on application to the manager of the station.

In 1932, the staff at the Mallee Research Station consisted of the officer in charge, a technical officer, and a general hand. It now consists of the manager, an agricultural research officer (two more are to be appointed), five technical officers, a clerk, and seven general hands. Past managers of the station have been Mr. H. L. Hore (1932–38), now Senior Agronomist in the Department; Mr. H. J. Sims (1938–46), now Cerealist; and Mr. J. Mc.C. McCann (1946–52), now Agronomist. The present manager is Mr. A. P. Mann.

PRODUCTION OF NEW CEREAL VARIETIES

One of the principal functions of the Mallee Research Station has been the production of new varieties of wheat and oats adapted for the Mallee. While the initial crosses are made at the State Research Farm at Werribee, the selecting of the unfixed and segregating crossbred material is done at Walpeup, and normally about 2,000 rows are sown in the stud cereal area for this purpose. As soon as possible, the fixed material is sown in drill-sown plots and compared with the standard and recommended varieties for yielding ability, flour quality, disease resistance, and general agronomic characteristics. Over 1,000 drill-sown plots are used annually in this varietal testing.

Three varieties of wheat and one of oats have been named and released from the Mallee Research Station. The first two wheat varieties, Regalia and Pindar, were selected at the State Research Farm at Werribee but, in the case of Insignia wheat and Orient oats, the selections were made at the Mallee Research Station.

The first variety named from the station was Regalia. It was the result of a cross between Ranee and Gallipoli, and was named in 1938. It is an early-maturing variety of medium height, with good yielding ability and better baking quality than the variety it was designed to replace (Rajah). Substantial areas of Regalia were sown for about twelve years after its release. The maximum acreage sown in Victoria was 172,871 acres in 1946.

Pindar, a selection from Ghurka, was named and distributed in 1941. This variety, of mid-season maturity, was designed to replace Ghurka. It gave higher yields than that variety, was slightly taller, and produced a grain with better flour

General view of the cereal plots in 1936, four years after establishment of the Station.

In the 1930's horses were used for all cultivating operations.

quality. It possesses the excellent flag-smut resistance of its parent variety. Pindar proved very popular with Mallee farmers in particular and, in 1946, it was sown on 348,385 acres in Victoria and was sown on 17½ per cent. of the total Mallee acreage.

The first variety produced under the programme of selecting in the stud cereal area at Walpeup was named in 1946. This variety, Insignia, was obtained from a cross between Ghurka and Ranee. It is an early-maturing variety with short, strong straw and excellent yielding ability. Its flour quality is slightly better than the other early-maturing varieties such as Ranee 4H and Bencubbin.

Insignia has proved outstandingly popular with farmers in Victoria. By 1948, it was sown on 357,000 acres, of which over 300,000 acres were in the Mallee. In 1953, it was the most widely-grown variety in Victoria, being grown on approximately 997,000 acres, which is 41 per cent. of the State acreage. In that year, it occupied 64 per cent. of the area sown to wheat in the Mallee, compared with 22 per cent. sown to the next most popular variety, Quadrat. Based on the results of variety trials in the Mallee in 1952, it is estimated that the average yields from Insignia on Mallee farms generally, last year, were at least 1½ bushels per acre higher than those harvested from the best of the other varieties available for sowing. On the area sown to Insignia, this would amount, last year, to an extra 1,000,000 bushels of wheat, valued at £700,000 in the Mallee alone.

Insignia has proved a very adaptable variety. It has given good yields in many districts of Victoria, and has also yielded satisfactorily in tests in South Australia and Western Australia.

The only variety of oats produced at Walpeup is Orient—a Palestine–Dawn cross-bred—which was named in 1947. Orient was produced as a special-purpose, early-maturing variety, suitable for the production of early greenfeed, and for grain production after such early grazing. In most early-maturing varieties, the early growth is upright, and stem formation commences relatively early. This means that grazing cannot be prolonged if a recovery yield is desired, because of the risk of destroying the developing head. In Orient, the prejointing or "grassy" stage is relatively long, thus allowing a longer period of safe grazing. Orient also gives high grain yields and, this year, is grown on 247,000 acres (24·2 per cent. of the oat acreage) in Victoria, being second to the well-known and widely-adaptable variety, Algerian.

CEREAL DISEASES

Since the establishment of the station, attention has been directed towards the control of various diseases in cereals, the most spectacular results being obtained in the case of flag smut. When the station was established, flag smut was regarded as one of the most serious diseases of wheat in Victoria. It was seldom that a crop was wholly free, and losses ranging from a trace up to 80 per cent. were recorded. Consequently, one of the first research programmes initiated was concerned with this disease; the work done at Walpeup being part of a State-wide research programme.

As a result of this work, much detailed information was gained concerning this disease. Investigations were made concerning the effect of time of sowing, depth of sowing, feeding-off, manurial treatments,

The farm water supply. The water is pumped to these tanks and reticulated for domestic and stock use.

and the use of resistant varieties. It was shown that infection by flag smut was governed to a large extent by the mineral balance in the soil.

A deficiency or a large excess of calcium (lime) results in a reduction of the development of the disease. There was optimum development at a soil pH of about 8, a degree of alkalinity very common in Mallee soils. Nitrogen decreased infection by altering the absorption rate of calcium, and a deficiency of phosphorus increased the infection; therefore, the use of adequate superphosphate tended to reduce infection. However, the most practical method of control is the use of resistant varieties.

The variety, Ghurka, was found to be resistant, and this factor has been incorporated by the plant breeders in new varieties, such as Pindar, Quadrat, Pinnacle, Insignia, and Diadem. The variety, Nabawa, is another resistant variety, and plant breeders in other States have used this source of resistance in producing varieties such as Bencubbin and Javelin.

To ascertain resistance of new crossbred material produced in Victoria, it is now the standard practice to test such material in the flag smut nursery at Walpeup, to ascertain the resistance of these new crossbreds to this disease.

OATS FOR GRAZING

Oats provide valuable winter and spring grazing and, in the Mallee, are probably the most satisfactory type of sown "pasture" yet available. At Walpeup, considerable research has been directed towards comparing varieties of oats, and other factors affecting the amount of greenfeed produced.

The first step in the research work was to devise techniques for comparing the varieties and treatments being tested, and to ascertain the relationship between the yield of oats as estimated by sampling methods and by grazing data. Another factor investigated was that of the growth phases of the plant. Comparisons of the ability of various types of oats to recover after grazing emphasized the necessity for a variety with a relatively long grassy or pre-jointing stage. Therefore, in breeding oats for grazing, selections are made to obtain varieties that mature relatively early but which have a long grassy stage and vigorous growth at this stage.

Another important factor in determining the amount of greenfeed produced by oats is the rate of sowing, or rather, the plant population. Small-grained varieties sown at a standard rate per acre give more plants per unit area, and in the earlier stages of growth (i.e., the grazing period) more plants give more greenfeed. It is, therefore, obvious that, to compare greenstuff yields of varieties, these varieties should be sown at rates to give comparable stands in terms of plants per foot.

Some of the staff homes, Mallee Research Station, 1953.

Portion of the large gathering of 1,000 people which attended the Station field day this year.

The most important result of the investigations on oats for grazing was the production of the variety, Orient, which has already been referred to.

SOIL FERTILITY AND CROP ROTATION

The maintenance of soil fertility in a condition that will enable the continued production of satisfactory crops is of vital importance. Therefore, one of the first considerations after the establishment of the research station was the design of a crop rotation experiment to investigate the effect of cropping, and of pasture, on soil fertility. Previously in Victoria, crop rotation trials had been conducted on plans similar to the classical Rothamsted trials, i.e., large single plots. At Walpeup, the design includes the replication of each course of each rotation, and many practical difficulties have been encountered in the conduct of the trial, which consists of 240 plots on permanent sites. For example, the grazing of the appropriate plots involves about four miles of temporary fencing annually.

Before the trial was commenced, a survey of the timber and soil on the area was undertaken, and a crop uniformity yield trial was conducted. Precautions have been taken to minimize any fertility changes due to soil erosion.

The yields obtained so far demonstrate the importance of good fallow, and that the yields of the frequently-cropped plots have been maintained surprisingly well. The trials have not been in progress long enough to ascertain any trends in the yields of the various crops. Data from supplementary trials on older land has shown that slightly higher yields have followed spelling the land for two years under natural pasture.

Long-term rotation experiments have shown that, eventually, there is normally a decline in yields where a legume has not been included in the rotation. At Walpeup, attention is being given to two types of legume for growing to maintain soil fertility in the Mallee. The first is the pasture legumes, which are referred to in the discussion on pastures. The second type is a crop legume—field peas. The work with this crop is being undertaken in co-operation with the School of Agriculture of the University of Melbourne. The first step has been directed towards breeding a pea more suitable for the Mallee environment, and steps are now being taken to multiply the more promising of the new crossbreds produced. Rotation trials, which include peas, have not been commenced at present, but preliminary trials have been undertaken to try to improve the stubble grazing available in the autumn, by sowing peas with the wheat, and leaving the peas unharvested in the wheat stubble.

SOIL EROSION

In the Mallee, soil erosion by wind occurs chiefly in two circumstances:—

(1) On the fallowed land of the normal cropping rotation;

(2) On light, sandy soil where the surface cover has been destroyed by overgrazing or other causes.

Since the inception of the station, particular attention has been given to the first type, and much experimental work has been done in connexion with soil cultivation and fallowing methods. Some type of fallow must be practised to conserve moisture to grow a satisfactory wheat crop. The value of surface trash to assist mechanically in the holding of the soil during this fallow period has been demonstrated. This surface trash can be obtained by the use of either dead or growing plant material. The former involves cultivation practices to leave as much as possible of the available stubble or other cover on the surface. The latter consists of the growing on the fallow of a cover crop—normally oats—sown in late winter or early spring, and grazing it so as to leave the stems to protect the fallow over the summer period. Considerable data concerning the efforts of these two methods of erosion control and on crop yields have now been obtained.

Comparisons have been made to show the effect of soil erosion on the subsequent wheat crop. It has been shown that severe erosion gives reduced yields and, in addition, wheat grown on such land has a lower milling quality than that grown on land that has not lost topsoil.

Other work at the station has demonstrated the importance of giving particular attention to those areas which present the greatest erosion hazard. This involves the adoption of differential cultivation treatments on the " drifting " areas of a paddock. Flats may be fallowed in the normal way, but the hills and lighter parts of the paddock should be cover-cropped or fallowed later—even after summer in some circumstances.

The outstanding control of erosion on loose sandhills is obtained by the use of rye. Rye will grow under conditions of much lower fertility than will many other plants. Experimental work with rye commenced at the Mallee Research Station in 1936, and was recommended for this type of erosion control in 1943. During the past ten years the area of rye in the Mallee where it is sown primarily for erosion control, has increased very considerably.

WEED CONTROL

The control of weeds presents particular problems on Mallee lands, where, owing to climatic and other factors, the area worked per farmer is larger than in other parts of the State, and where, because of the erosion hazard, cultivation is not always possible at the best time to control the weeds. Observations on weed control by cultural and agronomic methods have been made by officers of the station since its inception and, over the past eight years, information has been collected concerning the use of various selective weed killers.

The chief weeds occurring in the Mallee include mustard, wild turnip, saffron thistle, stemless thistle, stinkwort, onion weed, heliotrope, melilotus, and skeleton weed. Wild turnip was practically unknown until the early 1940's, but its spread was particularly rapid and, by 1945–46, it was present in all Mallee districts. Skeleton weed has spread alarmingly during the past five years.

Cover crops are sown on fallows in spring and, after the plants are firmly established, are grazed so as to leave sufficient stalks (and roots) to hold the soil over the summer.

The most economical method of control of the annual weeds is good cultivation and clean fallowing. This method is not so satisfactory in the case of those perennial weeds in which pieces of the plant will re-root and establish new plants. Also, as indicated above, the method may not be possible in some conditions because of the erosion hazard; and, in some circumstances, where the seasonal break is delayed, sowing may be done without the usual working of the fallow. In these cases, chemical weed control using the hormone-type weed killers and low-volume spraying equipment has given good results with certain types of weeds. The experimental work at Walpeup has demonstrated that this type of control is particularly efficient in the case of wild turnip and mustard with relatively light and cheap weed-killer applications (total cost about 8s. per acre). Weeds of other types are more difficult to control, but the research is continuing.

Preparing a fallow with a twin-disc, on the Mallee Research Station, July, 1947.

PASTURES

A diversified farming programme and the maintenance of greater numbers of live stock necessitate adequate provision for the feeding of such live stock. The grazing normally available on Mallee farms includes stubble, volunteer pastures, and oats sown for grazing. It is considered that there is much room for improvement in the types of pastures available for stock, and, since the establishment of the Mallee Research Station, tests have been conducted with promising introduced pasture species, and selections of promising pasture types have been made.

Particular attention has been given to legumes. These plants have the ability, in conjunction with root-nodule bacteria, to utilize atmospheric nitrogen, and are, therefore, of particular importance from two angles. From the stock viewpoint, they

General view of the pasture plant nursery, 1937. A large number of pasture species was included in the preliminary tests.

provide a protein-rich diet, and, from the soil fertility viewpoint, they are particularly valuable in increasing the total nitrogen in the soil.

The most suitable pasture legumes for the Mallee appear to be the medics, and over 100 species and strains have been tested. The most promising have been barrel medic and allied species but, at present, barrel medic is the only species available commercially. Selections made from barrel medic stands, naturally occurring in the Mallee, have shown considerable variation in leafiness, and degree of spininess of the burr. Lucerne, a perennial legume, also offers some promise in situations where grazing (by stock and rabbits) can be reasonably controlled.

The most common grasses occurring spontaneously after cultivation are barley grass and Arabian grass. The former provides good early feed, but has a very objectionable seed. Wimmera rye grass is the best of the introduced grasses tested. It provides a good bulk of feed, particularly in the spring. However, it can be a nuisance on land coming into cropping after grazing. Many perennial grasses have been tested, the best of which were perennial veldt grass and crested wheat grass, but neither was sufficiently good to justify recommendation for Mallee sowings.

Studies with pasture species have included comparisons of methods of sowing, rate of sowing, seed inoculation, and fertilizer requirements.

Data available at present indicate that the most suitable sown pastures for Mallee conditions are barrel medic and Wimmera rye grass, oats for grazing, and lucerne. The lucerne should be sown in such a position that it can be protected from grazing when necessary. There is still a big field for work on this aspect of Mallee farming.

SHEEP INVESTIGATIONS

Investigations with sheep have been conducted at the Mallee Research Station since 1939. This work has included comparisons of different sires and ewes for the production of fat lambs, and the collection of data with respect to supplementary feeding—both under normal conditions and in drought periods.

In the various breed trials, it is necessary to identify each lamb with its mother. Therefore, each lamb is tagged at birth and its mother's number recorded. Lambs are weighed at birth and at approximately monthly intervals, thus allowing growth rate comparisons of the different types (or treatments) of lambs.

Generally speaking, under Walpeup conditions, there has been little difference between the value of lambs sired by Dorset Horn or Border Leicester rams when mated to merino, comeback, or half-bred ewes. The former produces lambs that make growth quickly, mature early, and have a good percentage of first-grade lambs, while Border Leicester cross lambs develop well later in the season and carry good skins.

The most profitable type of ewe depends on the relative values of wool and fat lambs. Data on lamb production and wool weights have been obtained, and it is possible to calculate relative returns and profits with the different types of ewe tested, under varying price relationships. At present, the wool values are of prime importance, and the finer-woolled types give highest overall returns despite less satisfactory lamb returns.

Drought-feeding studies during 1943–45 showed that, in such conditions, supplementary feeding is practicable when some roughage is available in the paddocks, and a number of the lambs produced under drought conditions were marketed as fats. When paddock feed was exhausted before hand-feeding was commenced, the results were less satisfactory.

Seed storage barns at the Station.

Merino and half-bred ewes are used in management and breed investigations. These are mated to Dorset Horn and Border Leicester rams for fat-lamb production.

Other experiments showed that no advantage was gained by crushing wheat before feeding to sheep, and that when ewes were conditioned to wheat feeding, their ration could be fed successfully every second or third day.

INSPECTIONS BY VISITORS

The Mallee Research Station is open to inspection on week days and visitors are welcome. Arrangements for visitors to be conducted over the station may be made with the manager.

Discussions on agricultural and pastoral matters between the staff of the station and farmers help the farmer to appreciate the scope and value of the work being carried out, and also help the Department in planning its experimental programme.

Farmers' Field Days are held annually in October or November, and large numbers of farmers travel long distances to be present at this function. This year, the attendance at the field day exceeded 1,000, thus demonstrating the interest taken by farmers in the work of the station.

Fire Danger on Grasslands — Warning to Landholders

As pastures dry off a definite fire hazard will exist calling for the exercise of care by farmers and others in the danger areas. The greatest care and watchfulness will be necessary, particularly during hot and windy weather. Pasture officers of the Department of Agriculture, request landholders to give every possible support to the many efficient volunteer fire brigades operating throughout rural areas, and to take precautions on their own properties to minimize risks of outbreaks. Ploughed firebreaks, kept free of weeds and grass by cultivation, are valuable aids in holding grass fires. They help to trap flying debris and often give fire-fighters time to organize their defences. Many larger farms have tanks and pumps which can be readily mounted on trucks, and every landholder can have a supply of knapsack sprays and beaters ready for immediate use. Periodical inspection of all fire-fighting equipment should be made to ensure efficient working in times of emergency.

Tractors in the field need to be fitted with effective exhaust pipes and spark-arresters and, as a further precaution, should carry an extinguisher and a knapsack spray. Outbreaks of fire in harvest fields may result from faulty exhausts, over-heated bearings, or electrical faults. They are always unexpected and may become uncontrollable unless adequate precautions are taken.

THE DAIRY FARM

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When to stop making Silage

SILAGE-MAKING as a method of conserving fodder has its greatest appeal in those districts where summers are apt to be wet and where hay-making in the earlier part of the harvesting season is a risky venture. Farmers in those districts have already been advised by the Department of Agriculture to start silage-making early, for, although the cuts may be smaller, they are likely to obtain extra grazing from the regrowth of an early-cut pasture. A question which arises in every pasture-harvesting season, however, is when to stop making silage. This has received less attention than it deserves for, even in wet districts, there comes a time when conditions are no longer suitable for this operation. The farmer who still has surplus feed in some paddocks is then better advised to make it into hay. This time is determined not so much by the weather (rain could spoil hay even in February) as by the composition of the pasture and the stage of maturity reached by the plants.

Will the Silage Consolidate ?

Will the silage consolidate? This is a vital question for farmers conserving this type of fodder. Can the material be compressed in the stack, pit, or other storage to such an extent that most of the air will be excluded from it? A little air must remain to enable lactic-acid-producing bacteria to thrive and produce sufficient acidity to preserve the silage against the attacks of other organisms which would cause undesirable changes in it. But, if too much air remains—and this is the more common fault—the biochemical changes proceed too quickly. This causes overheating of the silage which leads to losses through charring. Stock may eat the charred product, but much of its food value will have been lost.

Over-mature material put in as silage cannot be compressed. It is springy, and takes in air as a sponge takes water as soon as the tractor has passed over it. To make matters worse, the weather is usually hot at that stage, and the material dries out rapidly as it lies in the paddock. Ideally, it should be picked up straight from the mower, but the farmer with only one tractor is more likely to cut enough for the day's carting and then to attach his buckrake to the tractor in place of the power mower. At the end of the day he will be carting in almost fully-cured hay which, in a silage stack, will become either very charred or very mouldy.

There is probably nothing wrong with an all-silage policy if all the silage made is good; but last season's experience shows that too many farmers made charred and mouldy silage out of their late-cut pastures, whereas, from the same material, they could have made hay which would have been good, although, perhaps, not first-class.

What has been said of pasture applies even more to hollow-stemmed plants such as oats. If these are slightly over-mature, it is not possible to expel the air from them.

Appearance of Cured Silage

How should silage look? Many farmers seem to have the impression that good silage should look rather like plug tobacco, but it should be much lighter in colour. At its best it is a very light yellow-brown, slightly tinged with green, and with a sharp, sweet odour. A darker hue indicates overheating, while a green silage with a very objectionable smell has not retained enough air in it to allow it to heat sufficiently. This type, often found in the bottom layer of a pit, is usually known as "sour" silage.

Farmers who are making silage now, or who have just completed the work, should make a note of the conditions under which it was made. These should be recalled when the silage is opened for feeding out, so that any mistakes will not be repeated in future harvests.

(K. M. Sillcock.)

Potash Fertilizers

Potash fertilizers and their possible use in pasture management have been the subject of inquiries from dairy farmers and others from time to time.

Potash is an essential plant nutrient. A deficiency first shows up in clovers, which grow less vigorously, become yellow in colour, and tend to burn around the leaf edges. Although a deficiency of available potash occurs naturally in a few soils, potash deficiencies usually occur as a result of bad management. If a paddock is cropped or harvested year after year and no organic matter, e.g., hay or silage, is returned to the paddock, it is possible for a potash deficiency to occur. A potash deficiency may also occur under a system of "day" and "night" paddocks which cause a gradual transfer of fertility by the stock from the day to the night paddocks, so that a potash deficiency may, in time, develop in the day paddocks.

The two purely potash fertilizers on the market at present are sulphate of potash and muriate of potash. Each costs approximately £40 per ton. When a deficiency of potash becomes evident, 1 to 2 cwt. per acre of potash fertilizer should be applied in the first year. After this first application, the annual dressing of superphosphate and potash can be combined by using about 2 cwt. per acre of the 3 and 1 super-potash mixtures sold by the superphosphate firms. The application of potash is very expensive, however, and it would be advisable to first lay down plots to ascertain if there is a potash deficiency in any paddock. If each plot is made 11 yards long by 4 yards wide, and 2 lb. of potash fertilizer is hand spread evenly over the plot, this will correspond to an application of 2 cwt. of potash per acre. Each plot, together with a similar area of untreated pasture, should be fenced so that any response may be noted. If the soil is deficient in potash, the clover on the treated area will grow more vigorously and have a deeper green colour than that on the untreated area.

A pasture deficient in potash becomes weedy, lacks vigor and the clovers tend to disappear.

Sulphate of potash is used more widely than muriate of potash. It does not absorb moisture so readily and is easier to spread.

Nitrogen Fertilizers

Sulphate of ammonia and nitrate of soda are the best known of these fertilizers, although mixed fertilizers containing nitrogen are now on the market.

Under the system of grassland farming practised by Victorian dairy farmers, the most economical way to maintain and build up the nitrogen level in the soil is to encourage the growth of clovers in the pasture. The first step is to introduce productive species and strains of clovers into the paddocks, and then obtain high production from them by proper fertilizer and grazing treatment. Superphosphate is usually the most-needed fertilizer. The pastures should not be allowed to grow too rank as the clovers would tend to be choked out by the grasses.

The clovers are invaluable in adding nitrogen to the soil. Like all legumes, clovers are capable of accommodating rhizobial bacteria in nodules on their roots. These bacteria take in nitrogen from the air in the soil and make it into foods which the clover plants use. Stock which graze these clovers then return much of these nitrogen foods to the soil in the form of urine and dung. Much of this nitrogen is then taken up by the grasses to give increased growth.

The only use that a nitrogen fertilizer, such as sulphate of ammonia, has in the management of Victorian pastures is in the production of "out-of-season" growth. For example, in a few cases, sulphate of ammonia has been used to produce a relatively good growth of pasture in winter and early spring, when pasture plants are normally making negligible growth. (K. FLYNN.)

The Young Farmer

What do they really want to know? How much do they know already? These questions must be in the mind of almost every specialist who is called upon to address a meeting of people not well known to him. To the speaker who is asked to "come and give a talk" to a Young Farmers' Club on some agricultural topic there are these questions and others, too, such as, "How will my suggestions fit into local farming conditions and practices?". These must be answered if his talk is to be a success. He usually answers these questions largely by guesswork and designs his lecture accordingly.

There is a better way than this to "pick the brains" of a visiting speaker who, after all, has been invited in the hope that he will tell you something you do not know already. It may take two meetings to do it, but the result is likely to be well worthwhile.

At the first meeting the club should discuss the chosen topic freely, and the members should try to find, among themselves, as many answers as possible to the questions which come into their minds. They will end that meeting with a clear idea of what they know already and what they want to ask the visiting speaker.

Then comes the second meeting, attended by the guest speaker. At the end of routine business the speaker is usually introduced and the chairman then says, "I will now hand the meeting over to him!" Why? It is the club's meeting, not his. He has enough responsibility already, in his function as expert adviser, and he should not be given the additional one of deciding what the meeting shall discuss, how it shall approach the subject, and for how long it should continue.

How much better for the chairman to say, after the introduction:

"We discussed such-and-such a subject at our last meeting, but, on some points, we did not have sufficient knowledge. This time we have our guest speaker to help us over that difficulty and, therefore, I have great pleasure in re-opening the discussion. I hope you will bring forward all those points which remained unsolved last time, and I am assured that our guest will join in and assist our discussion in every possible way. As a beginning, I know we would all like his comments on this question."

The chairman then puts one of the unsolved questions from the previous meeting, and the discussion is launched.

To most of those called upon to address meetings this would be a very welcome change from the usual procedure. At both meetings a discussion leader is needed. This may be either the chairman or some other member. His function is to keep the discussion moving and to direct it, mainly by asking questions of the group in general. A discussion which has been diverted from the topic in hand, or in which some important matter has been by-passed too quickly, can be brought back to the point very simply by a question from the leader.

A discussion by members of the Tarwin Valley Senior Young Farmers' Club, which was broadcast some time ago, was a good example of this method in operation. The discussion was directed almost wholly by questions from the leader.

(K. M. SILLCOCK.)

LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

Portion of Mr. H. E. Oliver's herd used in the dairy cattle feeding trials at Rochester.

FEEDING OF CONCENTRATES NOT ALWAYS ECONOMICAL

FEEDING trials with dairy cattle in the four main dairying districts of Victoria have shown that it is more economical to produce milk and butterfat from good pastures and home-grown fodders without the addition of purchased concentrates.

When the more common concentrates, such as crushed oats with some bran and pollard, were fed at the rate of a half-ton per cow per year (or 3¾ lb. per day, varying from 8 lb. per day when the paddock feed was short to 2 lb. per day in the spring) the annual production was lifted by about 35 lb. of butterfat per cow worth £8 15s. at 5s. per lb. When a protein-rich food, such as linseed meal was added to meet the protein requirements of the cow during the period when pastures were dry or short, butterfat production was lifted by a little over 50 lb. per cow (worth £12 10s.). Since a half-ton of concentrates costs between £12 and £15 delivered to the farm, the butterfat increase was not profitable. A farmer needs a reasonable margin to offset the extra work involved in feeding the concentrates and to cover the outlay of money invested in the concentrates. At present prices, an increase of 75 lb. of butterfat per cow would probably be needed to make such feeding profitable.

At Warragul, the farmers on the trial farms were producing out-of-season milk for the Melbourne supply. The production in the peak month of the year was only four times the production in the lowest month. At Rochester, for comparison, peak production was more than twelve times greater than in the month of lowest production. The premium paid for retail milk is partly to cover feed costs during the off-season.

As would be expected, the concentrates lifted production more at Warragul than in the other districts, but to offset this, less home-grown roughages were used when concentrates were fed.

On the three farms at Warragul, no concentrates were fed to one of the herds in each of the three years. When no concentrates were fed, 138 cows were milked for 800,000 lb. of milk and 38,700 lb. of butterfat. When low-protein concentrates were fed, 150 cows were milked on these three farms to produce 935,000 lb. milk and 44,500 lb. of butterfat. They received 136,630 lb. of concentrates. When the protein-rich linseed meal was included

in the concentrates, 951,000 lb. of milk and 46,000 lb. of butterfat were produced and 163,640 lb. of concentrates were fed.

At prices of 5s. per lb. for butterfat and £25 per 2,000 lb. for concentrates, the increased net return, after allowing for the differences in the quantities of roughage fed to the cows would have been £25 to £30 per farm annually. Although the general feeding of concentrates to milking cows has proved to be uneconomical on these farms, the need for concentrates for emergency feeding must not be overlooked.

[A.C.T.H.]

PREPARING GEESE FOR MARKET

The consumption of geese in Victoria is almost exclusively confined to Christmas time. It is a difficult market to cater for because the period between hatching and marketing is too short to produce birds in prime condition. Early-hatched goslings are barely four months old at Christmas and are only two-thirds grown. They lack the quality and condition of fully-grown birds. This can be overcome to a certain extent by feeding and management.

Grass-fed geese are never in prime condition, and breeders should realize that geese will never become popular for table purposes while this class of bird is marketed. Young growing stock which are obliged to forage for their food, do not obtain sufficient nourishment in concentrated form for rapid growth. They should be given at least one feed of mash a day and preferably two. Wet mash in the morning with dry mash always available is an excellent routine, and should be supplied four weeks before marketing. The mash should consist of ground wheat 30 lb., bran 20 lb., pollard 30 lb., ground oats 10 lb., meatmeal 10 lb., and salt ½ lb. Shellgrit should be always available, and in the absence of good pasture for free range, fresh, finely-chaffed greenfeed should be given twice daily. No grain is fed at this stage.

Layers pellets will give excellent results provided the birds eat them readily. A regular supply of clean, cool, drinking water is essential and more particularly when dry mash or pellets are fed.

It is optional whether the birds are confined to a shed or allowed out on range, provided it is quiet and secluded. They are sensitive to noises, are easily scared, and may go off their food for days if carelessly handled. It is a sound practice to convert food into profitable goose flesh rather than risk financial loss by marketing poor-quality birds.

Finally, pay particular care to the crating of your birds for market. Never place more than eight large, or ten medium-sized goslings in a turkey crate. Securely fasten water tins in the corners and provide food in suitable containers. Try and avoid consigning birds to market during very hot weather, as geese are susceptible to heat prostration.

[M. D. HALL, Poultry Expert.]

GRASSHOPPER SPRAYS AND BEES

At the time of preparing these notes (late October), there is a strong indication that grasshoppers in southern New South Wales and northern Victoria may reach serious proportions in the current season. If this occurs, large-scale control measures will be put into operation to destroy the pests.

A flock of high-quality Embden geese in the Craigieburn district.

(continued on page 570)

GANGRENOUS MASTITIS IN DAIRY CATTLE

G. NICOL, B.V.Sc., Veterinary Officer

MUCH progress has been made in the study of mastitis in its various forms, over the years. The following article, however, does not deal with the subject in a general way but discusses a special manifestation of the disease, namely gangrenous mastitis in dairy cattle. For a general article on the subject of mastitis the reader is referred to the publication, "Dairy Farming in Australia" (Victorian edition) compiled and circulated by the Commonwealth Department of Commerce and Agriculture, in which an article by H. R. Tucker, B.V.Sc., veterinary officer of the Victorian Department of Agriculture, appears. Gangrenous mastitis is a form of the disease which fortunately is not as common as some other forms of mastitis, but is one which, when it does make itself apparent in a dairy herd, can be a source of worry to the dairy farmer and present quite a problem from a treatment point of view.

The accompanying illustration gives a reasonably clear idea of the condition. It is a contagious disease which, if allowed to run its course without institution of preventive measures, could mean a tremendous loss of production through udder involvement of infected cows.

Gangrene of the udder

Symptoms

The main symptom of this condition is a gangrene of one or more quarters of the udder. When first noted it may be small in extent, but when untreated, further gross involvement takes place, and it is not uncommon for one or more quarters to slough off. A similar condition has been seen from time to time in ewes and goats, and in both of these species it may be necessary to amputate the complete udder before a cure is achieved. In cattle the milk is altered and in many cases this occurs before there is any outward appearance of disease. Individual cows show marked depression, loss of appetite, diminution of milk yield, and sometimes a high temperature. Death may occur before treatment has had a chance to be successful.

Commonly, the affected quarter becomes very enlarged, hot, and tense, generally painful, and often very hard. The owner may think that he has one of the usual cases of mastitis which he has previously had experience with, and which he has treated successfully with penicillin; accordingly, he may begin treatment after the usual fashion with installation of penicillin into the teat of the particular quarter, only to find that not only has there been no improvement in the appearance of the secretion of the quarter, but also that the skin is now apparently dead. The usual run of bland ointments applied to these skin lesions fails to arrest the development,

and in fact there may be even an extension to the skin along the belly. When this happens, the animal usually will die from an intoxication brought about by absorption of toxic products from the gangrenous quarter, which, of course, is undergoing various breakdown changes associated with the gangrenous infection.

Where a condition such as this appears in a dairy herd, it is well to be prepared beforehand. Submission of milk samples, collected in a manner in which contamination of the sample is minimized, to a recognized laboratory will be a preliminary step which can be of very great advantage in the early stages; it will assist very greatly in enabling a decision to be made as to whether the farmer should proceed with penicillin treatment. If for example, the report on the sample should read, "acute streptococcal mastitis", the owner will know immediately that he is right in proceeding with penicillin treatment; if, however, the report reads, "staphylococcal mastitis", it is questionable whether penicillin treatment is warranted. Certainly, the prospects of success with the usual dosage of penicillin are not very bright, and even with huge doses of penicillin, only a very small percentage of cases will respond.

Control

A more important consideration when a case of gangrenous mastitis occurs on a farm is to:

Immediately isolate the suspect cow and treat her as a source of infection to other cows in the herd. If this is not done, other valuable cows may be lost;

Be prepared for an affected quarter to slough off, and even for the cow to die despite sundry treatments which the owner may attempt;

If the cow is a valuable one, have a practising veterinary surgeon come immediately to treat her. Combinations of some of the more modern drugs give prospects of a cure provided only that treatment is started sufficiently early in the course of the disease.

LIVE STOCK NOTES—(*continued from page 568*)

Aerial spraying will be one of the most important methods used and, at the same time, one of the most dangerous to bees. During past plague seasons, complaints have been received from apiarists that numbers of their bees have been destroyed as a result of aerial spraying. Weather conditions in general, and wind direction and velocity, in particular, will have a marked effect on the spread of the insecticide after release from the plane, and no hard and fast rules can be laid down as to how far an apiarist should move his bees from the affected areas.

The best advice which we can offer the apiarist in case of large-scale hopper control measures is to get well out of the area and leave a good margin of distance for safety.

It is obviously not possible for special consideration to be given to apiaries located in plague areas. However, the apiary section of the Department of Agriculture will keep close liaison with the spraying authorities to obtain information on times and localities in which spraying will be in progress, and this information will be available to apiarists.

The danger period for bees from the aerial spraying is while operations are actually in progress. Within a day or two of the completion of spraying in any area, the risk to bees becomes very small, and losses are relatively insignificant. The only possible sources of danger might be contamination of pollen or nectar in flowers open at the time of spraying, and contamination of stagnant water, although the concentration of insecticide in the water would probably be very low.

[D. F. Langridge, B.Agr.Sc., Live Stock Research Officer.]

Garden Notes for January

By GEORGE HYAM

THE FLOWER GARDEN

Breakwinds Suitable for Coastal Conditions

THE provision of shelter around gardens situated near the sea is even more important than it is for those located inland, as winds blowing from the sea are usually heavier and more frequent and, when they reach gale force or even less, they are salt-laden and can cause considerable damage to most garden shrubs and herbaceous plants by blasting their foliage, if nothing worse.

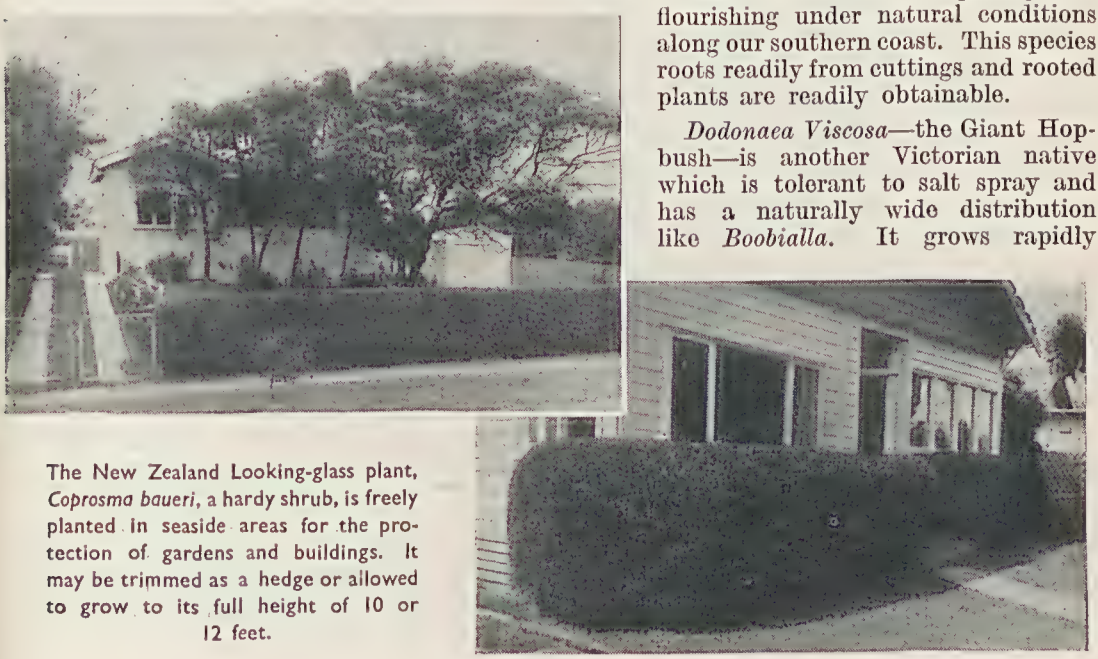
If the points suggested in planning shelter for gardens outlined in last month's notes are adhered to and certain more or less salt-resistant species are planted as the first line of protection, it is quite possible for home gardeners in coastal areas, even if they are close to the beaches or cliffs, to grow any garden plant suitable for the climate with suitable protection provided by carefully-selected wind-breaks.

The natural shrub and tree species growing on the adjacent coastal fringe are probably the ideal for such protection, but some of these are not easy to transplant or to obtain from nurseries, while some are rather slow-growing. The first step is to plant a row of some quick-growing species, mainly as a temporary protection for taller, more permanent, but slower-growing kinds if more height is necessary.

For this purpose, perhaps the most outstanding species is the *Coprosma baueri*, the New Zealand Looking-glass plant. It is well known and may be easily raised from seed. If watered in dry weather it grows rapidly and will quickly reach its normal height of approximately 10 feet. Coprosma is the better for fairly close planting—about 6 feet apart—and, may be trimmed occasionally to keep it compact. The waxy leaves give it complete resistance to salt and, in its native habitat, it can be found growing down to high-water mark.

Boobialla is another quick-growing breakwind and, although it might show some salt scorch on occasions, it quickly recovers. *Boobialla* is frequently seen flourishing under natural conditions along our southern coast. This species roots readily from cuttings and rooted plants are readily obtainable.

Dodonaea Viscosa—the Giant Hop-bush—is another Victorian native which is tolerant to salt spray and has a naturally wide distribution like *Boobialla*. It grows rapidly



The New Zealand Looking-glass plant, *Coprosma baueri*, a hardy shrub, is freely planted in seaside areas for the protection of gardens and buildings. It may be trimmed as a hedge or allowed to grow to its full height of 10 or 12 feet.

at about the same rate as *Boobialla* and eventually reaches the same height—about 10 to 12 feet—and is best planted at a spacing of about 5 to 6 feet. The Coast Wattle, *Acacia Sophora*, occurs naturally along our coasts and is quite suitable for quick-growing breakwinds. Plants may be difficult to obtain, but it is easily raised from seed.

The next and perhaps a more permanent and taller row might be planted with any of the following species which are slower-growing but are more ornamental.

Fugosia Pattersoni, the Norfolk Island Pyramid Tree, better known perhaps as the "Cow-itch", is very salt-resistant and has attractive flowers and foliage.

Metrosideros Tomentosa, the New Zealand Christmas Bush or Rata, is another coastal shrub, native to New Zealand. It produces brilliant scarlet flowers in large clusters.

Fugosia and *Metrosideros* grow to a height of 20 feet. The various species of tamarisk—other than the Athel tree—are coastal subjects and, when close planted, are often used as tall hedges up to 12 feet or as individual specimens. Oleanders resist salt well but they need moisture during dry summers to flourish well.

The native Coastal Tea-tree, although slow in growth, is well suited for districts where it grows naturally as, for instance, around Port Phillip or Westernport. Seedlings not more than 12 inches high should be lifted carefully with their fairly long roots intact, and this species is well worth considering as a permanent hedge or for single specimens.

For tall windbreaks for large properties, suitable species for positions likely to be affected by salt winds are *Pinus Pinaster*, the Maritime Pine; *Pinus Radiata (insignis)*, the Monterey Pine; or *Pinus Halepensis*, the Aleppo Pine, all of which will eventually grow to 40 or 50 feet. *Araucaria Excelsa*, the Norfolk Island Pine, is suitable where there is a moderate summer rainfall. The evergreen Chinese Elm, *Ulmus Chinensis* though slower growing than most, is a beautiful tree which will provide an abundance of spreading shade when it approaches maturity. All these and other tree species will grow faster if protected when young by the quicker-growing species and when in the juvenile stage, some could be damaged by spray unless protected.

Coastal Breakwinds some Distance from the Sea

During gales, salt can be carried for several miles inland, and breakwinds on properties within a mile or two of the coast, therefore, should be of species which are not seriously damaged by occasional salt drifts.

In addition to the species just reviewed, the following can be recommended as, although they may suffer some slight leaf scorch on occasions, no permanent harm will ensue.

Any of the cypress family could be planted; any scorching of these is usually confined to the young growth on the terminals. Most of the acacias usually grown in gardens suffer little from infrequent salting.

Among the eucalypts which are suitable for the inner coastal areas are *Lehmanii*, *Viminalis*, *Botryoides*, *Ficifolia* (red-flowering gum) among others. Any scorching of their foliage is very temporary. The flowering leptospermums or tea-trees; most of the callistemons and melaleucas, *Grevillea Rosamarinifolia*, *Hakea Laurina*, *Virgilia*, *Podalyria*, or *Tristania* would be only mildly affected at the most. Any of these would also be suitable for planting on properties close to the sea on the sides which are not subject to prevailing winds from directly over the water.

Once a seaside or coastal garden is adequately protected from wind off the sea, any kind of annual or herbaceous plant—most of which can be quickly destroyed by very slight salt drift—can be planted with safety within the range of effectiveness of the breakwind.

Plants for Breakwinds

The Department of Agriculture does not supply nursery plants of any kind but, in addition to the general plant commercial nurseries, certain species are obtainable by farmers and landowners at cheap rates from the Forests Commission Nurseries or from the nursery of the National Resources Conservation League at Springvale. Lists of species available and conditions of supply can be obtained from these bodies, together with planting information.

Compost and Composting

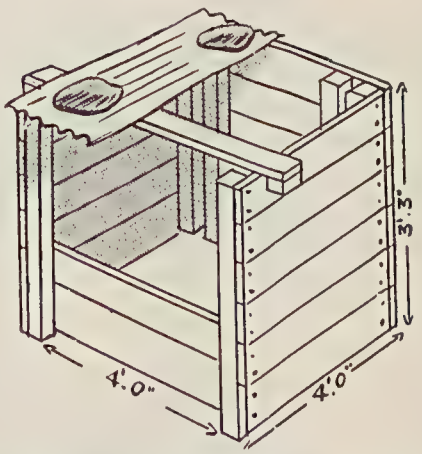
The old-time recommendations for the preparation of soils for vegetable growing in regard to digging-in lavish quantities of stable or farmyard manure are still quite sound. However, due to the difficulty which most gardeners have in obtaining quantities of these or other animal manures, some other form of organic manuring has to be substituted. This is not so much for the purpose of supplying inorganic plant food which those contain, and which can be supplied by judicious use of fertilizers, but rather as a means of supplying organic matter to keep up the relatively high humus content necessary for all forms of intensive culture which can quickly exhaust the comparatively small natural humus content of most of our soils. It is for this latter purpose that composting has become almost essential in the home garden at least.

In spite of the many and often complicated suggestions for making compost which have appeared of recent years, the operation is really very simple. In essence, it is the rotting down of any vegetable or animal waste to a stage when it is quickly available to plants, without the delay which occurs when the same material is merely dug-in in a more or less fresh state. There is no essential difference in the value of the compost whether rotted down quickly by use of accelerators, or by natural action without using such, but what is essential is sufficient air circulation through the heap to allow the particular bacteria which produces the proper state of decay, to be kept active. They also require a certain amount of heat and moisture and a sufficiency of nitrates to become fully active in their work.

To promote such activity, the first care is to restrict the height and width of the heaps to about 4 feet—the length is immaterial—so that air can percolate through the sides and top, and the bulk should not be so great as to cause a general packing down of the material. Apart from using accelerators to hasten decay, this can also be speeded up by turning the heap outside to inside, top to bottom, two or three times at intervals of three weeks but, nevertheless, a well-constructed heap will break down in time—say, in about six months when made in summer—as against the eight to ten weeks which an accelerated and turned heap will take to reach the same stage. The speed of the breakdown is also regulated by the nature of the material used. Coarse and large, woody waste naturally takes longer to decay unless it is chopped into small sections and, in some cases, as for cabbage stalks or straw, bruised. Turning the heap and the use of accelerators hastens decay.

The manurial value of compost expressed as inorganic plant food is variable and depends on the composition of the heap. The more animal manures incorporated the richer it will be, and these also happen to be the best and quickest accelerators.

One of the fastest in action is urine of any kind, watered on from time to time, just moistening the material without actually saturating it. The vegetable waste itself contains inorganic elements in some degree and in variable quantity according to species but, where no animal manure is used, compost should be looked upon more as a source of humus and valuable in that regard, rather than what is commonly accepted as "manure", and thus it usually needs supplementing by some fertilizer.



A portable compost box. This type of box is a neat adjunct to the home garden. In this design the sides are attached to the back by four bolts and nuts, so that the box can be quickly dismantled. The front boards are loose and inserted as the box is filled and may be removed one by one for ease in emptying. Two loose sheets of galvanized corrugated iron, weighted down, are used as a cover, and a removable timber crosspiece carries these and holds the sides in position.

Other accelerators are blood and bone or any "complete" fertilizer. These are not as rapid in action as animal manures. The commercial accelerators, though helping to promote breakdown, probably add nothing in the above regard.

The diagram shows an effective box or bin which is suitable for making compost in the home garden, and it avoids the rather unsightly appearance of a heap. When filled to capacity with composting material this afterwards sinks to less than half the bulk. A box of the dimensions shown holds approximately a ton of compost. For smaller lots, it can be divided by a removable partition. Another advantage is that there is much less undecayed material at the sides than is common in heaps which have not been turned and the layers reversed.

If any form of brick or concrete bin is used, these should be provided with plenty of ventilation holes at the sides and back, otherwise the breakdown will be retarded. No heap or bin should have a concrete floor but the lower layer of the material should be in direct contact with the soil. Further details of the building of compost heaps and their handling will be found in a leaflet which is obtainable free on application to the Horticultural Division, Department of Agriculture, Treasury Gardens, Melbourne, C.2.

A point which might be stressed here is that, if a compost heap is properly built, there is no odour, nor does it breed flies. Even garbage can be included but, in this case, if placed on the top of a heap, it is best covered with a sprinkling of old compost or a 2-inch layer of soil causing any odour to be quickly dispersed by the natural action of the breaking-down bacteria. The same procedure should be used if any meat waste is included. The alternative to this covering is to bury odorous material under a layer of the partly-decayed matter already in the heap.

Applying Compost Economically

The average home gardeners rarely have large quantities of compost available and sufficient to dig it deeply into the soil, say, to spade depth, which is the ideal. Assuming that the soil is not entirely deficient in humus, this can best be maintained and even increased by applying any limited quantities of compost as a mulch or, perhaps, if slightly larger quantities are at hand, by incorporating in the first few inches of the top-soil. While it is desirable to have a garden soil which has a good humus content to spade depth, limited quantities are more effective when placed at or near to the surface. Some should always be kept for use as a mulch for each crop and, if this is laid to a depth of an inch, it will provide for the needs of most vegetable crops and still leave a residue which is turned under at the next digging.

In the course of time, depending on the thickness of each mulching, the organic content of the lower soil to spade depth is gradually built up too. For mulching in summer time, it is not aboslutely necessary that the compost should be completely broken down when applied. Half-rotted compost soon decays in warm weather if kept moist, and much is incorporated into the top soil by natural action before the crop finishes. Animal manure composted down with vegetable matter is more valuable than if applied separately, particularly in regard to improving soil texture, which is also important for healthy growth.

CERTIFIED PULLORUM-TESTED POULTRY FLOCKS

A certified Pullorum-tested Flock is one in which all stock over six months of age have given a negative reaction to the agglutination test for Pullorum Disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector, but it is not necessarily a guarantee of the type of birds in the flock.

The under-mentioned flocks have been certified by the Department of Agriculture, and will remain so for the current calendar year, or until such time as the Chief Veterinary Inspector determines.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Particulars of breeds of birds tested are as shown hereunder :—

A. Australorp ; B. White Leghorn ; C. Rhode Island Red ; D. Sussex ; E. Langshan ; F. Brown Leghorn ; G. Buff Orpington ; H. Black Leghorn ; I. Minorca ; K. Legbar ; L. Turkeys ; M. New Hampshire ; N. Plymouth Rock ; O. Indian Game ; P. Ancona ; Q. Blue Leghorn.

Owner.	Breed.	Number of Birds.
Adlington, G. A., Maldon-road, Castlemaine	A, B	1,312
Anderson, G., Torbay-street, Macleod	A, B	1,387
Barnes, A., "The Heights," Blackburn	A, B, C	2,400
Barnett, W. H., 17 Brougham-street, Box Hill	A, B	549
Bassett, R., South Muckleford ..	B	135
Bayfield, A. E., Westall-road, Springvale	A, B, C	1,058
Bayfield Poultry Farm (J. E. Robinson), Bayfield-road, Bayswater	A	752
Booth, S. J., Benalla-road, Shepparton	A, B	595
Boyce, A. D., Springvale-road, Forest Hill	A, B	1,455
Bray, J., 18 Hotham-street, Warrnambool	B	123
Browning, Robt., Grimshaw-road, Bundoora	A, B, C	154
Campbell Bros., 133 Johnston-street, Newport	B, C	1,914
Casson, D., 20 Avoca-crescent, Pascoe Vale, W.8	A, B, C	1,299
Cook and McKnight, Lyons-road, North Croydon	A	2,326
Corbett Bros., Torbay-street, Macleod	A	2,647
Crawcour and Edmonds, Clarinda Poultry Farm, Centre-road, Clarinda	A. B. C	2,401
Crawcour and Edmonds, Ashgrove Poultry Farm, Mountain-road, Cockatoo	A, B	1,643
Cumming, H. D., Darlington ..	A, B	113
Davey, A. R., Sellars-street, Greensborough	A, B	1,445
Davidson and O'Keefe's Hatchery (Mrs. G. Hocking), 22 Sherbrooke-avenue, Ringwood	A. B. C	664
Davies, L. F., Ireland-road, Spring Vale	B. C	2,581
Davies, R. G., 24 Sherbrooke-avenue, Ringwood	A, B	906
Day, L., Kyvalley	A. B. C	2,252
DeGruchy, Frank, 56 Kingsville-street, Kingsville ..	C	33
Dookie Agricultural College, Dookie	A, B	2,074
Ellen, J., Rossmoyne Pig and Poultry Farm, Avoca	A, B	4,558
Ellis, G., Merrigum	A, B	2,616
Etherington, R. R., Karadock-avenue, Irymple	A, B	2,396
Fagg, V. C., 679 Riversdale-road, Box Hill	B, C	582
Firkins, H., Frankston-road, Cranbourne	A, B	2,645
Fitchett, C. W., Springvale-road, Tally Ho	A, B	742
Ford, J. V., 11 Barker-avenue, Shepparton	A. B. C	990
Frost, M. C. (Mrs.) "Araluen," Barwon Heads	A. B. C	1,003
Frye, I. H., Grimshaw-street, Watsonia	A	1,123
Fullerton, G. H., Long Gully, Bendigo	A, B	967
Gibbs, J., Highway Stud, Lower Plenty	A, B	914
Grenville, G. W., Grenville Stud Poultry Farm, Springvale-road, Springvale	A, B, C	3,051
Grice, J., North-road, Langwarrin ..	A, B	998
Gwyther, R., Valley-road, Highton, via Geelong	A, B	1,265
Haigh-Lumby, J., Cranbourne-road, Frankston	A, B	622
Hall, C. Huon Park, Cranbourne ..	A, B	3,685
Hanson, S. H., Box 7, Kilmore ..	A	43
Hayes Bros., Mt. Dandenong-road, Montrose	A, B	1,893
Hoffman, C. W., 5 Pearl-street, Horsham	A, B	2,985
Holder, G. E. and W., "Seven Acres," Ferntree Gully	A	308
Hurst, B. H. G., New-street, Eltham	B	1,816
Ikin, Eric J., 44 Mackay-street, Seddon, W.13	C	200
Jenkin, H. A., Torquay-road, Belmont	B	665
Johnson, M. (Mrs.), Ivanhoe Poultry Farm, Ferntree Gully	A, B, C	2,147
Kenneally, W. R., Hampton Park ..	A, B	1,110
Kennedy, F., cr. Watson and Ferntree Gully roads, Glen Waverley	C	759
Kerr, J. J., Clarke-road, Springvale	A, B	3,126
Kostos Bros., Waverley-road, Oakleigh	A, B, C	2,904
Kroker, W. E., Horsham	B, C	742
Lambert, D. L. (Mrs.), Donald-road, Wheeler's Hill	B, C	92
Le Lievre, R., Katandra	A	734
Longerenong College, Dooen ..	A, B	1,144
Lucas, George, Liverpool-road, Kilsyth	A, B	352
McCabe, R., Gladstone-road, Dandenong	A, B	1,626

CERTIFIED PULLORUM-TESTED POULTRY FLOCKS—*continued.*

Owner.	Breed.	Number of Birds.
McCann, Ian R., Crowlands - road, Stawell	A, B	1,660
McCann, R., and Son, "Moray," Crowlands-road, Stawell	A, B	4,392
McGahy, Mary E. (Mrs.), Manningham-road, Doncaster	A, B, N, O	606
McKay, D., Landell's - road, Pascoe Vale	B, C	4,329
McLaren, A. D., Alexander - street, Mooroopna	A, B, C	1,248
McLister, K. C., 173 Hall - street, Spotswood	A, B, C	6,930
McLauchlan, D. F., Rossiter - road, Koo-wee-rup	A, B	1,392
McMahon, G. J., Burwood - road, Vermont	A, B, C	1,217
McQueen, R. J., Spring-road, Highett	C	517
Major, C. D., 59 Simpson's - road, Eaglehawk	A, B	3,232
Mason, David B., Montalbo - road, Ringwood	A, B	1,275
Maytime Stud and Hatchery, (R. J. O'Brien), Watson's - road, Glen Waverley	C, D	525
Mills, J. J., Kilvinside-road, Noble Park	A, B, C	1,378
Milner, R. J., 59 Austin - crescent, Pascoe Vale, W.8	A, B, E, P, Q	2,585
Modra, L. H., 43 McCulloch-street, Nunawading	A, B	859
Morris, C. H., St. Clem's-road, Doncaster	A, B	524
Mudford, C. A., 15 Kirkwood-street, Eaglehawk, via Bendigo	A	1,005
Mumford, L. J., Healesville ..	A	347
Musgrove, J. M., 16 Wellington-avenue, Blackburn	B	1,261
Myer Emporium, "Norman Lodge," Mt. Eliza)	A, B	2,320
Neale, S., Edward-street, Boronia ..	A, B	1,038
Nemet, P., Springvale-road, Springvale	A, B, C	3,456
Nicholls, J. A., Nathalia ..	B	206
Paton, W., Glenburnie-road, Mitcham	B, K	606
Pearton, J. J. and Mrs. O. W., Arthur-street, St. Albans	A, B, C	1,516
Pitman, I. (Mrs.), Kangaroo Ground	D	52
Poulton, Alan W., Vickers - street, Sebastopol	A, B, C	2,156
Rae, John, 277 Albert-street, Sebastopol	A, B	1,835
Reid, R. C., 114 Graham-street, Castlemaine	A, B	938
Ridge and Son, Myrtle-grove, Blackburn	B, C, D	3,527
Ruskin Poultry Farm and Hatchery (A. McVay), Kernot-street, Spotswood, W.14	A, B,	3,411
Ryan Bros., Junction-road, Blackburn	A, B	453
Sadler, S., 99 Baynes-street, Terang	A, B	810
Salmond, J. B., Deer Park ..	H, Q	100
Scales, J., and Son, West Wattle Tree-road, Boronia	A	2,263
Schulze, L. H., Torquay-road, Grovedale	A, B	1,749
Simpson, G. D., "Greenways," Mayroad, Glen Waverley	A, B	3,562
Smith, F., Lenham Stud Poultry Farm, Terang	A, B	2,123
Snodgrass, R., Pakenham East ..	A, B	1,366
State Research Farm, Werribee ..	A, B, K	1,200
Stephens, R., Reservoir-road, Kennington	A	1,835
Stewart, H. D., Marshall-street, Maryborough	C, K	417
Stewart, J. A., Maldon-road, Castlemaine	A, B	295
Stoneman, J. W., Campbell - road, Briar Hill	C, F	216
Streeter, H. A., Avoca	B	524
Swift, D. A., Kangaroo Flat ..	A, B	2,045
Taylor, H. L., 180 Surrey-road, Blackburn	A, B, M	288
Taylor, H. R., 119 Rathdown-street, Reservoir	A, B, C	1,941
Taylor, R. H., 132 Rathdown-street, Reservoir	A, B, C	3,874
Thomas, W. A., Springvale - road, Springvale South	A, B, C	1,093
Thomson, G., "Fortuna," Westall-road, Springvale	A, B	1,186
Timms, H. B., 23 Yarra-road, Croydon	A, B, C	162
Trevallyn Poultry Farm (Tubb, F. H.), Sydney-road, Campbellfield	B, C	3,101
Turner, John, Research	C, D	193
Voight, A. H., Follett-road, Cheltenham	A, B, C	1,344
Waiting, T., Scoresby-road, Bayswater	A, B	1,735
Waugh, A. J., Kangaroo Flat ..	A, B	856
Wohlers, S., Dooen-road, Horsham ..	A, C	385
Wooster, C., Stanhope	A	608
Wright, A., Wunghnu	A	700